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ABSTRACT

Three kindergartens and one prekindergarten, totaling 213 children, participated in a Behavior Modification program during the 1971-72 school year. A research assistant in each location worked directly with the teacher in measuring and evaluating teaching methods and in developing alternative procedures as needed to teach the same skills or behaviors. Overall program evaluation was based upon a modified BRL Checklist given to the four Behavior Modification classes and to two control classes. Experimental analyses were provided for each intervention utliized in the Behavior Modification classes. Results show that teachers can use their time more effectively and efficiently when certain techniques are added to their own methods. In over 25 studies, comparisons between the teacher's usual method and the same procedure combined with specific behavioral techniques suggest that children can be taught more and in a short period of time with these techniques. Academic areas covered included time and position concepts, past tense, left and right discrimination, and colors, in addition to several studies that focus on general classroom management. Data for all groups on the BRL Checklist indicated that only the Behavior Modification kindergartens produced statistically significant changes over the school year. The entire cost of special material and incentives averaged less than $.86 per child for the year. (Author/KM)

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RESEARCH AND DEVELOPMENT REPORT

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ACHIEVING ACADEMIC AND SOCIAL OBJECTIVES IN KINDERGARTEN THROUGH BEHAVIORAL ANALYSIS

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PREFACE

Since maintaining orderly behavior within the classroom has traditionally been a major problem for teachers, many studies have been conducted focusing on this area of concern. Research in the area of applied behavior analysis has demonstrated that procedures based on systematic principles of reinforcement can be effective in maintaining classroom discipline; therefore, studies were made in the Atlanta Public School System to determine whether a minimum of disruption should give improved academic performance. The results have indicated that there was no facilitation of academic achievement despite the elimination of classroom disruption, however, it was found that focusing on academic performance, the disruptive behavior was drastically reduced.

The Achieving Academic and Social Objectives in Kindergarten Through Behavioral Analysis is the result of a three-year study in the Atlanta Public School System, in which the curriculum and instructional methods were analyzed with the view of giving the teachers a handbook. The studies, on which this handbook was based, were funded under the Elementary and Secondary Education Act of 1965 (ESEA), Title I, and subcontracted to The Center for Applied Research, Georgia State University. The handbook should be especially helpful for those persons who are not familiar with the principles and their applications.

This handbook is by no means all inclusive. Some of the basic ideas are presented; however, more specific information can be found in previous reports including "A Nine-Month Token Reinforcement Program for the Trainable Retarded," Research and Development Report, Volume VI, Number 1, Summer, 1972 and "Teacher's Primer of Behavior Modification Techniques," Research and Development Report, Volume VI, Number 2, July, 1972.

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ABSTRACT

Three kindergartens and one prekindergarten totaling 213 children participated in a Behavior Modification program during the 1971-72 school year. A research assistant in each location worked directly with the teacher in measuring and evaluating teaching methods and in developing alternative procedures as needed to teach the same skills or behaviors. Overall program evaluation was based upon a modified BRL Checklist given to the four Behavior Modification classes and to two control classes. In addition, experimental analyses were provided for each intervention utilized in the Behavior Modification classes.

Results show that teachers can use their time more effectively and efficiently when certain techniques are added to their own methods. In over 25 studies, comparisons between the teacher's usual method and the same procedure combined with specific behavioral techniques suggest that children can be taught more and in a short period of time with these techniques. Academic areas covered included time and position concepts, past tense, left and right discrimination, and colors, in addition to several studies which focus upon general classroom management. Moreover, data for the Behavior Modification groups and control groups on the BRL Checklist indicated that only the Behavior Modification kindergartens produced statistically significant changes over the school year. It is noteworthy that the entire cost of special material and incentives averaged less than $0.86 per child for the entire year.

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The authors wish to express appreciation to everyone who participated in the Behavior Modification programs, but especially to the following teachers: Barbara Hale (Ed S. Cook); Hattie Logan, Pastsy Terry, and Diane LaBudde (D. H. Stanton); Winnie Powell (Luckie Street Prekindergarten); and their teacher aides: Thelma Hill and Flora Carswell (Ed S. Cook); Sylvia Spratling, Caroline Tucker, and Elizabeth Jorden (D. H. Stanton); Mary King (Luckie Street); and Jackie Miles (Luckie Street Prekindergarten).

Ingenuous and innovative solutions to many of our problems were provided by our colleagues, Dora Way and Ronnie Dugger. We are grateful for their assistance in the design and implementation phases of this program and greatly enjoyed having them as co-workers.

Our thanks also go to the principals of these schools: Ms. Gladys Eubanks (Luckie Street), Ms. Gwendolyn George (D. H. Stanton), and Mr. Sheffield S. Kemp (Ed S. Cook). Without their cooperation and interest, this program never would have been possible.

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I. INTRODUCTION

The Atlanta Public School System contracted with The Center for Applied Behavior Research, Georgia State University, to conduct a Behavior Modification program in three kindergartens for the 1971-72 school year. The goals of the program were to:

A. Assist the teacher in devising measurement techniques which would provide her with reliable feedback on her teaching efforts.

B. Evaluate the effectiveness of certain teaching procedures with the teacher and assist her in the development of alternative procedures.

C. Provide research consultants to assist the kindergarten staff in the application of behavior modification techniques in their classrooms.

The three Title I schools participating in the project were D. H. Stanton, Luckie Streeet, and Ed S. Cook. In addition to the kindergartens in these three locations, the prekindergarten from Luckie Street also participated in the program. The total enrollment for these classes was 213 children involving six teachers and seven teacher aides. Program activities began within one month of opening of the school year and continued until classes were dismissed on June 5, 1972.

Personnel. Each of the three kindergartens and prekindergarten were staffed with a research assistant under the supervision of Dr. T. Ayllon of The Center for Applied Behavior Research of Georgia State University. The research assistants were Ms. Dora Way (D. H. Stanton) and Ms. Kathy Kelly (Ed. S. Cook) who were employed on a full-time basis, and Mr. George O'Neill (Luckie Street Kindergarten) and Mr. Ronnie Dugger (Luckie Street Prekindergarten) who each held a half-time position.

Description of Program. Early in the program certain problems existed which were not unexpected in applied research activities of this scope. The role of the research consultant was not completely clear to some of the teaching staff, particularly to those who had formed their approach to kindergarten teaching after years of experience in this area. The consultants were not experienced teachers nor were they teacher aides who participated in the maintenance functions of the class. The jargon of "goals," "objectives,"

and "effective feedback" were familiar terms to the teachers but not in the context of the daily functionings of the class. Perhaps the major problem in initiaiting the project was the implied or unstated nature of the teacher's objectives. For example certain teachers indicated that an important goal for the year was to instill a "sense of responsibility into each child." While all concerned might agree that such an objective was highly desirable, a more specific statement was needed before procedures could be designed to meet that objective.

Fortunately, in early February the Curriculum Guide in Early Childhood Education, compiled under the direction of Dr. E. Curtis Henson, Assistant Superintendent for Instruction, Atlanta Public Schools, was made available to all four teachers in the Behavior Modification program. Because the curriculum guide described goals and objectives for the kindergarten and prekindergarten in detail, a major portion of these problems were resolved. Evaluation procedures were offered, through which the teacher could judge for herself if the children were meeting criteria. Moreover, the curriculum itself was described as a single program with separate units, each broken down into finite behaviors which could be observed and measured. For the first time, the teacher and the research consultant could meaningfully discuss how to achieve a "sense of self" for each child or to increase "cooperative play" within the group. These concepts and many more were described both generally and behaviorally so that the efforts of both the teaching staff and the consultant could be joined to reach a common goal.

While each school had unique problems and goals of its own, many similarities existed among the classes. The curriculum guide served as the basis for selection of subject matter, and new material was introduced by the teacher as the children progressed from one level to another. The research consultant served to record, measure, and assist the teacher in evaluation of her own teaching efforts. Afternative procedures were introduced only when the data indicated that the methods being used were not effective or were too slow in producing the desired results. Alternative procedures varied from a rearrangement of consequences for the response to the addition of a reinforcing event for correct responding to a reanalysis and modification of the teaching procedure itself. The specific details of each intervention will be given in the following sections.

Description of Operations. The general purpose of the Behavior Modification program was to assist the teacher in measuring the effects of her own teaching efforts and to devise new methods which might be utilized in teaching the kindergarten curriculum. Design of interventions was always made with the objective of making it workable for the teacher, that is, putting together systems which required no additional time, personnel, or unusual resources. The majority of the studies reported here were conducted in this format. In a few studies, it was necessary for the research consultant to participate directly in the implementation of an intervention. Such cases arose when, for example a pilot study with a small number of children was deemed advisable prior to implementation with the entire group and the teacher's time would not extend to such a luxury of research effort. Too, the complexities of certain interventions required that the research consultant "model" for the teacher, who then assumed implementation control herself.

Teacher aides shared much the same role vis à vis the research consultant as did the teacher. Teacher aides were observed and given feedback by the consultant through the teacher. Interventions were kept as flexible and comfortable for individual personnel within the program without putting stress or excessive requirements on their execution.

Evaluation of Educational Procedures. Various strategies are available for use in comparative evaluation of applied programs and for general research efforts. The most familiar approach might be the experimental vs. the control group method. The researcher matches two groups which are similar in all respects except for one variable and that one variable (or set of variables) is applied to the experiemental group. After a specified period of time the two groups are compared and any differences between the two are attributed to the variable(s) added to the experimental group. Evaluation is typically made using a statistical treatment of the two groups on some measurement taken after that specified period of time.

Another strategy for comparison of some experiemental treatment is to take a measure on some behavior for one group, e.g., achievement level and then subject the group to some treatment, such as a special program or additional enrichment classes. The measure is applied again at the end of a specified period of time and the pre and post intervention scores are compared. Any

change is hypothesized due to the intervention, but other variables certainly could have affected the scores as well. These other variables might be practice effect, acclimation to the setting, or some other unidentified variable. Thus, a control group, which does not receive the treatment, often is given the same evaluations before and after the intervention period. This allows the evaluator to note any changes which might accrue due to unidentified factors rather than from the intervention.

A statistical treatment also may be given to these pre and post intervention measures. A within group measure tells the experimenter how much a group has changed between the two evaluations. If both have changed equally and in the same direction, then the intervention may not have overcome some other major variables. Or, if the experimental group changed significantly more than the control group, and they were similar in all respects except for the intervention applied to the control group, then the data would suggest that the intervention indeed had made a difference. And how much difference? A between group measure would compare the two groups either on the first evaluation, taken before the intervention, or on the second evaluation taken after the intervention. This yields a statement of the amount of difference between the two groups. If the study is well-designed and the intervention is effective, then the "before" scores will be equivalent and the "after" scores will reflect some difference between the groups due to the intervention.

In applied behavior research it is not always possible to match all variables well enough to use a pre-post evaluation. Nor is it feasible always, for in that design the effects of the intervention are only hypothesized as the variable which made the difference and some degree of error is allowed. Fortunately, there are two other major strategies for evaluation which free the researcher from the constraints and possible limitations of the two designs above.

The first is the ABA or Reversal Design. This design begins with a baseline period during which the number of occurrences of a certain response, such as number of correct colors named, is counted and recorded. This period of basline is designated as "A." Some intervention is then imposed upon the response in the "B" phase of the experiment; this independent variable may be

any stimulus of a known reinforcing value. Finally after several sessions of measurement of the behavior under the new conditions, the conditions would return to these in effect during the baseline (A phase).

As an example of this type of experimental design, if the number of correct colors named each day under standard conditions was measured for 10 days and found to average 2.5 colors per day out of 10 colors this would constitute the baseline measurements. If the children were then given stars for every color they name correctly, it might be found that for 10 days it averaged 9.0 colors correct per day. This would constitute the treatment or "B" phase. Then, taking out the stars and observing the behavior for another 10 days, it might be found that the average fell to only 2.1 colors named correctly per day.

Under these conditions, then, an effect upon colors named correctly per day has been demonstrated. If there is still some questions as to whether or not the effect was due to the experimental condition, the stars could be reinstated and withdrawn as many times as necessary in order to adequately demonstrate the effect.

The second design used by applied behavior analysts is called the multiple baseline design and allows the practitioner to deal with several behaviors or several subjects simultaneously while maintaining a rigorous application of the intervention procedures. Using this technique, measures are taken on the responses of several children, for example, in naming colors. This procedure provides some baseline measures against which the intervention effects can be compared. Following the baseline, the intervention is applied to one of the children, for example a special game to teach colors, while the others do not play the game yet but continue "under baseline conditions." If the experimental condition produces a change in the response, and little or no change in the other responses, then rather than reverting to baseline conditions as in an ABA design, the experimental procedure (color game) is applied to a second child. The intervention is then applied to a third child and so on singly and successively. The objective is to demonstrate that the game is a reliable procedure in that each child made his maximal performance only when the experimental intervention is introduced.

It is not uncommon in educational settings to encounter behaviors that are "irreversible." Once a child learns to complete a page of work more accurately and quickly, for example, he is not likely to lose that performance increase immediately upon withdrawal of the motivational variable. This type of design allows for a demonstration of the control of the independent variable over several behaviors without requiring that the behavior be returned to its previous rate, a reversal which may not only be impossible but may be also educationally undesirable. This design is widely used in the studies which follow.

At this point, a summary of these four strategies for educational evaluation might be helpful. Each has its merits and its weaknesses as discussed earlier but each has its place in research activity as well as an applied program such as this. The four strategies are:

1. Statistical Analysis -- a comparative statement made concerning the statistical probability of certain changes occurring in the evaluation measures. This strategy may be used with other designs, such as pre-post, for it is simply an additional treatment to evaluation scores regardless of the method used to gather the data.

2. Pre-Post Analysis -- a comparison of two measures taken before or after some intervention is introduced. This strategy may or may not be statistical. Change in the two measures is attributed to the intervention procedure. Often, a matched control group is utilized to allow for other variables, such as time or practice, contributing to the score changes. Comparisons may then be made between two groups, one of which received some special treatment, or within one group itself, before and after the treatment or intervention was applied.

3. ABA or Reversal Design -- a procedure which demonstrates the critical intervention variable(s) by taking a baseline, then adding the intervention, and then removing the intervention. If the behavior rises and falls with the intorduction and removal of the intervention, the experimenter may be confident in the fact that his intervention accounted for the changes in the behavior. If there are any doubts he may re-introduce and again remove the intervention and note the effects.

4. Multiple Baseline Design -- a design which allows several behaviors for for one individual or the same behavior for several individuals to be measured at the same time. The intervention is applied successively to each behavior, one at a time. This design allows for demonstration of the control of the intervention without requiring that improved academic (or social, etc.) behavior be taken out.

These designs are all included in this report. In a few cases, variations of the basic strategies have been devised to meet certain design problems. Thus, the design utilized in each study is specified and elaborated upon where variations occur.

The remaining sections of this report will be arranged as follows. First, a summary of the pre and post program testing and comparison of these results with the control groups will be presented. The next four sections will discuss problems and interventions in the categories of teacher behaviors, disruption, specific concepts, and special techniques which may not have been used before by many teachers in early childhood areas. Each analysis is a separate unit, descriptive of a particular classroom problem, with an alternative solution presented and discussed. The final section of this report will discuss general conclusions and recommendations for future programs.

II. RESULTS OF PRE AND POST PROGRAMMING TESTING

The instrument used for the pre and post evaluation testings was based on the Behavior Research Laboratories (BRL) Checklist for pre-reading skills. The BRL program is widely used in the Atlanta Public School System and the concepts evaluated in the Checklist are found in all recent curriculum guides for preschool levels. The instrument had been used in an earlier program "A Comparison Between Standard Instruction and Reinforcement Program for the Trainable Retarded, Summer, 1970," Research and Development Report, Volume IV, Number 3, 1970, and was expanded to include additional preschool objectives drawn from curriculum guides and the specific recommendations of teachers in this school system. A total of 52 items comprise the modified BRL Checklist in the following subject areas: colors, shapes, counting, body parts, seasons,

comparisons, position, and personal identification information such as name and address.

Two control schools were selected for comparison with the Behavior Modification schools on the basis of economic level similarity of their enrollments. The two kindergarten classes recommended for comparison purposes were Moreland and Harris schools. A third control class was also available and provided a unique opportunity for evaluation of certain effects of the program; the kindergarten at the Luckie Street School had a morning and afternoon group taught by the same teacher and no interventions were applied to the morning group beyond any carry-overs made by the teacher herself. Thus, in the pre and post program comparisons, the morning kindergarten group at Luckie Street would provide some basis for statements about generalization of teachers' experience to other settings in the early stages of training.

All seven groups were administered the Checklist early in the school year and during the final three weeks of school. Three separate analyses were made based upon this data.

Within Group Analysis. The first analysis asks the question, "How much did each group change over the school year as shown in the pre and post measures?" and represents a comparison of each groups' pre and post program average against itself. A one-tailed t test for repeat measures was the statistical treatment for this analysis. The null hypothesis was that no groups would show change from the pre to post testing. The results of this analysis is presented for each group in Table 1.

As shown by the t values, all groups, both experimental and control, increased their scores to a statistically significant level. Such a result is not expected. Many of these children experienced their first exposure to a formal learning atmosphere and, indeed, were taught a great many things by being in comparatively enriched environment. Further, all kindergartens are designed to be centers of carefully structured play through which the child gains knowledge and experience while enjoying himself. If any kindergarten did less than increase the child's skills on the curriculum-based Checklist, there would be serious doubt as to its effectiveness in meeting a fundamental commitment to the educational system.

TABLE 1

GROUP MEANS FOR EACH CLASS BASED ON THE CHECKLIST SCORES

	N	Pre	Post	Change	T Value	P
Experimental Groups						
D. H. Stanton	72	19.93	36.65	+16.72	21.137	<.001
Ed S. Cook	72	23.94	37.74	+13.80	28.491	<.001
Luckie St. (P.M.)	16	27.00	38.19	+11.19	11.270	<.001
Luckie St. (Pre-K)	20	19.80	30.60	+10.80	8.824	<.001
Control Groups						
Moreland	26	23.42	27.54	+ 4.12	3.547	<.005
Harris	20	25.45	33.25	+ 7.80	5.600	<.005
Luckie St. (A.M.)	13	29.80	35.92	+ 6.12	4.528	<.001

Between Group Analysis. Based upon the understanding that all children experiencing a year in kindergarten will show improvement in basic skill areas, one might now ask, "Did the experimental schools, where Behavior Modification was utilized during the year, perform any differently from the control groups, where the teachers used no special procedures in addition to their own teaching techniques." The null hypothesis for the one-tailed test was that there would be no difference between experimental and control groups. Table 2 summarizes these comparisons between all experiemental and all control groups.

All experimental kindergartens showed a greater average increase and at a statistically significant level, than did the control kindergartens. The experimental prekindergarten also increased more than the control groups but in one case (Luckie Street prekindergarten vs. Harris kindergarten), the increase was not of a significant level. In all cases where Behavior Modification was employed in the classroom, Checklist scores were higher than in those classrooms using standard procedures. Although all groups had increased over the school year, the experimental groups produced greater change as reflected in the Checklist scores, than did the control schools.

TABLE 2

COMPARISON OF MEAN GROUP CHANGES FROM PRE TO POST TESTING

	x = mean group increase	Control Groups: Harris N = 20 x = +7.8	Luckie St. (P.M.) N = 13 x = +6.08	Moreland N = 26 x = +4.35
Experimental Groups	Ed S. Cook N = 70 x = +13.79	t = 7.753 p < .001	t = 10.966 p < .001	t = 12.135 p < .001
	Luckie St. (P.M.) N = 16 x = +11.19	t = 2.00 p < .025	t = 2.976 p < .005	t = 4.64 p < .001
	D. H. Stanton N = 72 x = +15.89	t = 6.405 p < .001	t = 3.32 p < .001	t = 9.297 p < .001
	Luckie St. Pre-K N = 20 x = +10.80	t = 1.618 p < .10	t = 2.85 p < .005	t = 3.537 p < .001

Post-Program Testing Analysis. Since the fact that all groups increased their scores over the school year, one might ask "How different were the groups at the end of the kindergaten experience?" A comparison was made between the two groups, based on the final Checklist scores in order to answer this question. As shown in Table 1, the program means for the control groups were generally higher than for the experimental groups. Since all groups increased significantly from the pre to their post program testings, a comparison of the post-program scores alone would seem to favor the control classes over the Behavior Modification groups. A one-tailed t test was applied to this data to test the null hypothesis that the control groups would be equal to or significantly higher than the experimental groups on the post-program testing. Table 3 summarizes the comparisons of all kindergartens on the post-program scores.

TABLE 3

COMPARISON OF POST TESTING MEANS FOR ALL KINDERGARTENS

	x = post test means	Control Groups: Harris x = 33.25	Control Groups: Luckie St. (A.M.) x = 35.92	Control Groups: Moreland x = 27.54
Experimental Groups	Ed S. Cook x = 37.74	$t = 5.48$, $p < .001$	$t = 2.15$, $p < .025$	$t = 10.8$, $p < .001$
	Luckie St. (P.M.) x = 38.19	$t = 2.401$, $p < .01$	$t = 0.900$, Not Sig.	$t = 4.198$, $p < .001$
	D. H. Stanton x = 36.65	$t = 5.31$, $p < .005$	$t = 0.5864$, Not Sig.	$t = 12.38$, $p < .001$

In all but two comparisons, the experimental groups averaged significantly higher than the control groups on the second testing. One of the two nonsignificant differences was between Luckie Street morning (control) and afternoon (experimental) groups. In referring to Table 1, one finds that the control group averaged 2.80 points higher on the first testing. Although the experimental group increased 5.02 points more than the morning groups (control) the initial imbalance was sufficient to reduce the post test means to a statistical "no difference." In the other case of "no difference," one of the classes again was at the Luckie Street (A.M.) kindergarten (Luckie Street A.M. kindergarten vs. D. H. Stanton kindergarten). Some carry-over effort is to be expected from the daily contact with behavioral procedures in the afternoon group since the same teacher directed both groups. This may have accounted for the lack of statistical significance on the post testing between this group and two of the experimental kindergartens.

Reading Program Results. While all the kindergartens increased their performance on the checklist over the school year, it was possible for the teachers, depending upon their motivation and own unique skills, to go beyond the standard kindergarten program. One such case might be mentioned here as a reflection of the overall scope of the program. The teacher had produced such rapid performance increases with her children that by the Spring of the year they were ready for a reading program typically reserved for the first

grade. This teacher began using the Scott-Foresman Reading Systems program and completed Level I by the end of the school year. The first grade in that same school also used this reading program and had completed Level I after four months of first grade. Both groups took a test at the completion of Level I and the comparison of these results is outlined in Table 4.

TABLE 4

AVERAGE SCORES AFTER THE COMPLETION OF READING SERIES LEVEL I

Group	Experience	N	Average Score
Kindergarten	9 months of kindergarten	56	43.12
1st Graders	4 months of first grade	50	44.48

Clearly, the kindergarten group scored as well as the group which had had a full four months of first grade experience. More than one-half of the first graders had also had kindergarten experience the previous year. Nevertheless, their scores, after an additional four months of more intensive academic training, were equivalent to those of the group which had received only kindergarten experience.

Several conclusions may be drawn from these data. First, kindergarten children who are equipped with the prerequisite skills may perform as well on first-grade material as children with one-half year of first grade experience. Some of these skills which are necessary before reading can be taught are included in the studies presented in this report. While one may surmise that the kindergarten group was adequately prepared for the reading program, how was it that they were enabled to complete the program at such a high level of proficiency? Although there is no experimental analysis to demonstrate the control of particular variables in this study, one might note that the kindergarten class utilized a token system of reinforcing correct academic responses. The children earned tokens throughout the course of the reading program, but

did not earn tokens on the test itself. Nevertheless, the high test scores suggest that the token system for daily work may have effected their performance indirectly by making their learning more efficient and more lasting.

Summary. The data presented here indicated that the three Behavior Modification kindergartens and the prekindergarten class performed better than the two classes which did not use behavioral techniques. The Checklist reflects these differences but it lacks specificity as to where the differences between the groups lie. What took place in the Behavior Modification classes which would account for the changes? What procedures were used by those teachers which resulted in the greater Checklist performance?

The following sections of this report will present the procedures used by teachers in the experimental classes. Each section is comprised of several studies, all of which were designed to solve a similar problem.

III. THE MOTIVATIONAL SYSTEM

Before discussing individual studies, a discussion of the general format characterizing any motivation system might be helpful.

Many successful teachers can take a class of children and with little or no additional assistance produce impressive results: Their children are alert, interested, well-behaved and academically productive. Do these teachers have a special natural talent or are they simply lucky in acquiring a group of children ideally suited to their own styles of teaching? Neither hypothesis seems completely satisfactory, but perhaps each contributes some part of the answer to the question, "How do they do it?"

Some teachers have learned from their children what the children enjoy doing most in the classroom, either by asking them, or better, by observing what they do when given some free choice situation. This knowledge allows the teacher and her class to build a system together where both can get what they want from daily classroom experience without overriding or ignoring the wishes of the other. The teacher may know, for example, that her class enjoys recess more than any other time of the day. She may then use additional minutes of recess as a special reward for some outstanding performance, such

as being first in line, as something to be earned in specific ways, for example, by the child who improves his spelling score the most over the previous day's test score. These are but two examples of the many used every day by the observant teacher.

Some situations present special problems, however, in getting the children interested enough to "try harder" and increase their academic effort. In these cases, more immediate effects for their effort can be provided. The kindergarten teachers in this report frequently used raisins, pieces of cereal, or small candies when they wanted to show the children immediately that they liked what the children were doing. The children had no doubt that they had done something good, for they not only received a goodie, but a great deal of praise and attention as well. Some difficulties arose, however, when the children were doing well all of the time; the teacher couldn't continually give out little treats for every good action and with too much of a "good thing" (the goodies), the children got tired of making an effort to earn them or had to make no effort at all! Further, this system ignored all the available reinforcers built into the classroom such as those previously mentioned. How could the teacher systematically use all these potential motivators without distracting the children or losing the effectiveness of these activities by too long a delay in getting to enjoy them?

One solution to this problem is the use of a token system which bridges the gap between earning time and enjoyment time but without losing the effectiveness of either period. When the child performs some required action, such as naming colors correctly, he receives a token or tangible sign of that performance. He has learned that the token is a valuable item for it can help "buy" some of the things he likes best in the classroom (running errands, erasing the boards, being first in line) or out of the classroom (additional minutes of recess). The token may be used also to purchase candy or trinkets, depending upon his interests. His token may be in the form of a poker chip, a painted bottle cap, or a cardboard circle upon which is drawn a "Happy Face." The form is not important, only the function. The token allows the teacher to reward her children for their efforts by having a variety of items and activities always ready for them. This prevents a child from losing interest by over-exposure to any one reinforcer by giving him a day to day variety from which to choose.

Some teachers prefer to use the edibles for a short time and then gradually use them less frequently until they are not used at all. This "fading out" procedure requires very careful attention to the way the edibles are utilized so that performance does not reduce for lack of reinforcement. A skilled teacher can make sure of her timing and use additional reinforcers like praise and hugs while she gives less and less tangible reinforcement. This process can be successful if done with precision but it is difficult to achieve. Other teachers begin with edible reinforcers and then move into a full scale token program which has the double benefit of freeing them from the problem of "too much dependence upon the goodies" while still utilizing wealth of classroom reinforcers.

The studies which follow utilize the concept of the motivational system in a variety of forms. Not only are edibles and tokens ("Happy Faces") included but the popular reinforcers of stars, charts, and badges are also widely used. Whatever the actual dimensions of the motivational system, the primary concept was to let the children know in an unmistakeable way that their good efforts are pleasing and appreciated.

IV. ACADEMICS

The following studies deal with the aquisition of specific concepts on the part of the kindergarten and prekindergarten children included in this project. In most cases, interventions were made only after usual methods of teaching proved to be too slow or too tedious. Eighteen separate studies are described here -- eleven of which are unique studies and seven of which are replications. It is felt that these eighteen studies were the most important interventions influencing the Checklist results.

Study A. Discrimination of Left and Right Hands

Problem. The majority of the kindergarten children did not come to school knowing the difference between their left and right hands. Following the objectives outlined in the curriculum guide (p. 69), teachers at one kindergarten attempted to teach this discrimination through the use of games and records. However, after three weeks most of the children still

did not know their left hand from their right hand. The immediate problem was to design a method which would teach this concept quickly and effectively.

Subjects and Setting. All 21 children in the kindergarten took part in this study which lasted for 12 days.

Response Definition. The response under observation was the raising of the appropriate hand in response to the verbal command, "Raise your left/right hand."

Evaluation Procedure. A pre-post design was used in this study to evaluate the strength of the behavior (correctly identifying the left or right hand) before and after the introduction of the independent variable.

Procedure. Data was collected on the responses made to the command "Raise your right (or left) hand." This data collection was carried out in such a manner that children could not see the responses made by other children. Over a period of three weeks each child was asked for either his right or his left hand (commands presented randomly) at least 12 times. For the next 10 days the procedure was as follows. When the child arrived at school he was asked, where no one else could see his response, to raise his left hand. The child was told whether he was right or wrong and his response was recorded. (The right hand was never asked for during data collection in order to add stability to the data. The reason for this will be explained later.) Throughout the day the teachers were instructed to ask the children to raise their right or left hand and to give feedback as to correctness or incorrectness of the response. No effort was made at these times to shield the responses of each child from the others. On the third day of this procedure, and for the next three days, a mark was made with a green ball point pen on the left hand of each child. This was done each day after the data collection. In most cases, the green mark did not wash off from one day to the next; therefore, most children had the green "cue" during data collection on the fourth through the seventh day of the study.

On the eighth day of the study, right after Christmas holidays, the children came to school **without** the "cue" on their left hand. Data was

collected as before for the next four days, and the teachers continued to ask for right and left hands during the day. No marks were made on the children's hands. On the eleventh day of this study, the children were asked to raise their right hand during the data collection period instead of their left hand in order to check for generalization.

Results. Correct responses to the request, "Show me your right/left hand," was raised from a baseline level of 30 per cent correct to an average of 75 per cent correct when the intervention was introduced.

Over the first three days, where the children had no cues, the per cent correct never exceeded 35 per cent as shown in Figure 1. Since there is a 50 per cent chance of being correct, one would expect this baseline to be near 50 per cent. However, there seems to be a predisposition to raising the right hand (since it's the one most often used) when one doesn't know the correct response. Unless one corrects for this predisposition by asking for either the left or right hand, but not both, then the data is very erratic. As seen in Figure 1, the data is very stable over the next three sessions, each session lasting about ten minutes. Most of the children responded to the cue (green mark) and raised the correct hand (79-84 per cent of the children were correct on these three sessions, for a total of 30 minutes spent acquiring the correct response). However, after the cues had been removed (1/4 to 1/6) the performance remained high (65.9 per cent to 81 per cent of the children made the correct responses). A post check was made on 1/20 and the performance was still high (81 per cent).

By giving immediate feedback and providing cues which are slowly faded out, left and right discrimination could be taught to most children (with lasting effects) in less than one week.

Replications. This procedure was replicated with a total of 198 children: at the prekindergarten with 24 children, at one kindergarten with 82 children, and at a second kindergarten with 92 children. Stable baselines were achieved at all schools except at the prekindergarten where the per cent of children correct ranged from 20 per cent to 60 per cent over a period of four days. The baselines at the first kindergarten and at the

Acquisition of Left and Right Hand Discrimination

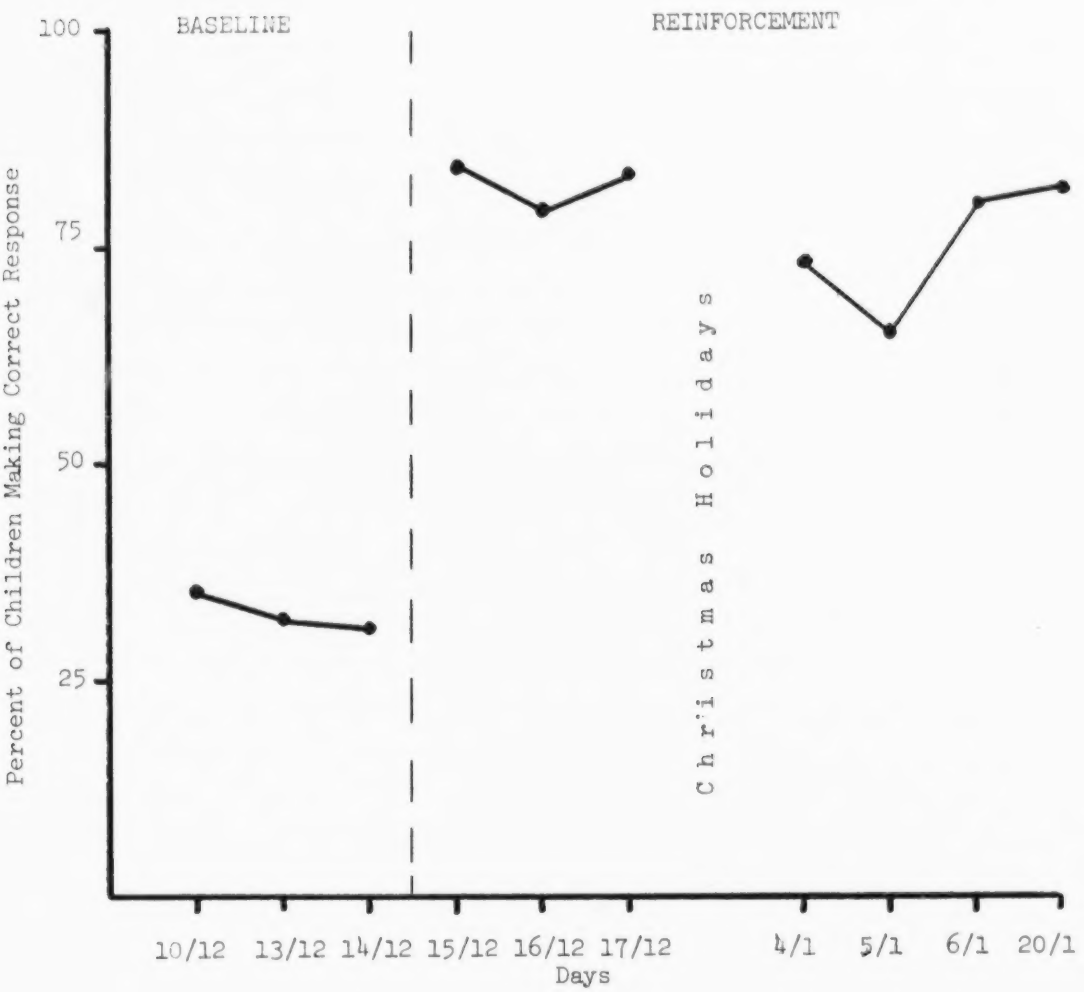

Figure 1.

second kindergarten ranged from 46 per cent to 48 per cent (2 days) and from 48 per cent to 54 per cent (4 days), respectively. The results at these schools were similar to those in the original study: the prekindergarten went from an unstable mean of 40 per cent correct (baseline) to a stable mean of 90 per cent correct (intervention); the children at the first kindergarten went from a mean of 79 per cent to 99 per cent correct; the children at the second kindergarten went from a mean of 51 per cent to 81 per cent.

Study B. A Look at Piaget's Analysis of Left and Right Concepts

Problem. Many teachers have considered the kindergarten year to be a time denoted primarily to the development of social behaviors with a lesser focus upon strictly academic endeavors. Often, this emphasis is necessitated by the great burden placed upon the kindergarten teacher to teach in school some of the basic skills which children formerly brought with them from home. The kindergarten day is crowded with experiences which must be provided these children in order to better equip them for handling first-grade material. The teacher hardly has time to complete these activities much less to explore additional academic questions.

In one Behavior Modification kindergarten, however, the teacher was afforded the luxury of exploring a question of academic importance relating to her kindergarten curriculum. She had found that teaching a child to correctly identify his left and right hands was a simple task using the procedures described in the previous study. Could she, however, go one step further and teach the child to identify the left and right of another person or of three objects? The literature in this area suggests that only at certain ages can these concepts be taught to a child and then, only in sequenced order. Piaget outlined the three acquisition stages for the concept of left and right: Stage 1 (5-8 years of age) where the child considers left and right only from his point of view; stage 2 (8-11 years of age) where the child can view right and left from another person's standpoint but where the child cannot deal with right-left relation of three objects; stage 3 (usually 11-12 years of age) where the child considers right and left from the standpoint of

objects. The teacher had already mastered Piaget's first stage using the "helper marks" technique and was curious to see how far the children could go through these stages. Was age really a prohibitive factor or could the children be taught to function at the second and third stages several years earlier? The questions asked in this study were (1) can a child between the ages of 5 and 8 (stage 1) be taught to respond correctly to questions associated with stages 2 and 3? and (2) If so, does the child have to learn stage 1 and stage 2 before learning stage 3?

Subjects and Setting. Twenty-one students in one kindergarten class participated. All data collection and manipulation was done outside the classroom in a small room with table and chairs. Twenty-one students in another kindergarten class served as a control group.

Response Definition. Elkind[1] had used certain items presented in the form of tests which gave him the stage at which each child was functioning according to Piaget's theory. The responses made by the children to these tests constituted the response being measured in the study. The six tests and the content of each are listed below.

The Six Tests in the Study of Right and Left Conceptions

Test	Corresponding Stage	Content
I	1	Show me your right hand. Show me your left hand. Show me your right leg. Now your left.
II	2	Show me my right hand. Now my left. Show me my right leg. Now my left. (Examiner is opposite child, facing him.)

[1]Elkind, David. "Children's conceptions of right and left: Piaget replication, Study IV." Journal of Genetic Psychology, 1961, 99, 269-276.

Test	Corresponding Stage	Content
III	2	(A coin is placed on the table to the left of a pencil, from the child's point of view.) Is the pencil to the right or to the left? And the penny?
IV	2	(Child moves to examiner's side of the table and the same questions as in Test III are asked.)
V	3	(The child is again opposite the experimenter and three objects are placed in front of him: a pencil to the left, a key in the middle, and a coin to the right). Is the pencil to the left or to the right of the key? And of the penny? Is the key to the left of right of the penny? And of the pencil? Is the penny to the left or the right of the pencil? And of the key?
VI	3	(Child moves around to the examiners side of the table and the same questions as in Text V are asked.)

Each test was scored as either correct (all responses correct) or incorrect (one or more answers incorrect).

Evaluation Procedures. This study utilized two types of statistical analysis: T test of independent means for between group comparisons, and z test for within group comparisons.

Procedure. All procedures in this study were implemented by the research assistant. The test battery described above was administered to both the experimental and control groups to serve as a pretest measure. The test was administered on two more occasions to the experimental group to determine the effects of repeated presentations on performance. This served as a baseline from within-group controls.

Training and testing were scheduled to answer the following question: "Does experience in lower stages of functioning accelerate the learning in the upper stages of functioning; that is, is each stage a prerequisite for the next?" The training-testing format was scheduled as follows:

1. Pretest on all six tests
2. Training on Test IV (Stage 2)
3. Testing on all six tests
4. Training on Test VI (Stage 3)
5. Testing on all 6 tests
6. Training on Test II (Stage 2)
7. Testing on all 6 tests
8. Training on Tests V (Stage 3)
9. Testing on all 6 tests.

Training was then begun, with the experimental group, on a task similar to Test IV (Stage 2 functioning) of the test battery. The stimulus items were changed: a cup, spool, and a small wooden cube were used instead of the pencil and coin. The training was conducted with each child individually as follows: Two stimulus items were placed in front of the subject, who was seated beside the examiner. The child was then asked if one certain object was to the left or to the right of the other object. Immediate feedback was given as to the correctness of the answer. The stimulus items then were changed or rearranged and the child was again asked whether one certain object was to the left or the right of the other. This procedure was continued until a total of six questions were asked. If the child gave the correct response to all six questions, he was given a choice of several reinforcers (trinkets and candy). If the child missed one or more questions, he was given another session later. Training was continued for two days. Only two children were unable to answer the six questions correctly after five separate tries each day. They were given a reinforcer at the end of the fifth try, regardless of their performance, in order to reinforce their attempts at answering the questions.

After the two days of training, the test battery was given twice, once each day for two days, to assure stability of the results. Training

was then begun on a task similar to Test VI (Stage 3 functioning) of the test battery. Training was conducted for two days in the same manner as before, except that three of the following four stimulus objects were used for each presentation: cup, spool, crayon, wooden cube. Each child was again asked six questions: two concerning an object on the left, two concerning an object on the right, and two concerning an object in the middle (the presentation of the questions and the order of the stimulus items was random). The same contingencies were in effect as in training for Test IV. Two children were not able to answer all six questions correctly by five tries (the same two as before). They were given a reinforcer at the end of their fifth trial. After training the test battery again was administered twice to each child.

Training on Test II (Stage 2 functioning) was then undertaken for the next two days as follows: the children were shown, in a group, why another person's left hand was on one side when they are facing you and on another side when they have their back to you. The children then came, one at a time, to the experimenter, who sat behind a screen. The experimenter facing the subject then asked "Which is my right (or left) hand?" Immediate feedback was given. The next child then came behind the screen and was asked the question. Each child was given two opportunities to answer the question. If they were correct on both occasions, they received a choice of several reinforcers. If they were not correct on both occasions, they were given another chance later in the day. Ninety per cent of the children received reinforcers by the end of the second try. By the end of the third try, all children had received reinforcers. The test battery then was administered twice to each child over a period of two days.

Training then was begun on a task similar to Test V (Stage 3 functioning). The children were shown that when they are on one side of the table, a particular object may be on the left, but when they moved to the other side of the table, that object will be on their right. Reinforcement was made contingent on six correct answers out of six questions relating to the position of one of three objects, from one

side of the table and from the other. Three children were not able to answer all six questions correctly by the fifth trial (same two as before plus one more student). Reinforcement was given, regardless, after the fifth trial.

Once again the test battery was administered twice. On the second day the test battery was given again to the control group to serve as a posttest.

Results and Discussions

Between Group Analysis. Children between ages five and eight can be taught to function at advanced stages of left and right discrimination. Table 5 gives a comparison of control vs. experimental groups in terms of pre and post tests.

TABLE 5

T TEST COMPARISON* OF CONTROL AND EXPERIMENTAL GROUP

	Pretest				Posttest			
Test	Mean Control Group	Mean Experimental Group	t	P	Mean Control Group	Mean Experimental Group	t	P
I	.43	.64	1.339	NS(.2)	.43	.90	3.859	<.001
II	.35	.32	0.2008	NS	.39	.72	2.329	<.025
III	.39	.50	0.73	NS	.40	.59	1.3509	NS(0.1)
IV	.34	.22	0.89	NS	.30	.86	4.55	<.001
V	.00	.00	...	NS	0.00	.32	3.239	<.001
VI	.00	.00	...	NS	0.00	.77	8.742	<.001

* All t scores one-tailed, df = 32).

It can be noted that the two groups are not significantly different on the pretest. The experimental group mean of Test I is higher than the mean of the control group. This is probably due to the fact that over

90 per cent of the children in the experimental group had received behavioral training on a similar task (see Study A of this section). However, this difference is not statistically significant. On the posttest, in all but one case, the means for the experimental group were statistically significantly higher. The remaining test (Test III) was close to significance.

Elkind (1961), as well as Piaget, used the somewhat arbitrary level of 75 per cent correct as the criteria for saying that a certain age group had mastered a specific test. It was with this criteria that Piaget formulated his three stages in the development of left and right conceptions. Using this criteria, it can be seen from Table 6 that the 75 per cent correct level is surpassed by the experimental group on the posttest scores of Test I (Stage 1),Test IV (Stage 2), and Test VI (Stage 3). This evidence plus the results summarized in Table 6 indicated that five year olds can be trained to perform at the Stage II and Stage III levels.

TABLE 6

PER CENT OF CHILDREN PASSING TEST IN ELKIND'S SAMPLE AS COMPARED WITH EXPERIMENTAL GROUP (PRE AND POST)

	Test I	Test II	Test III	Test IV	Test V	Test IV
Elkind's Sample	83%	20%	53%	10%	3%	0%
Experimental Pretest	64%	32%	50%	23%	0%	0%
Experimental Posttest	91%	73%	59%	86%	32%	77%
T Comparison* of Elkind's Sample to Experimental Pretest	$t = 5.05$ $p < .001$	$t = 2.964$ $p < .01$	$t = 0.613$ NS	$t = 4.23$ $p < .002$	1.889 NS	... NS
T Comparison* of Elkind's Sample to Experimental Posttest	$t = 2.224$ $p < .05$	$t = 3.0099$ $p < .001$	$t = 1.2759$ NS	$t = 25.59$ $p < .001$	$t = 13.82$ $p < .001$	$t = 61.09$ $p < .001$

* All t scores two-tailed; df = 2, 30).

Within Group Analysis. The between groups analysis indicated that young children at Stage 1 ages could be taught to perform at Stages 2 and 3. But the question was as yet unanswered regarding the sequence of these stages. Was it necessary to go through Stages 1 and 2 before Stage 3, or could these stages be taught in any order? The within group analysis sought to answer the question.

Table 7 gives the results of a z test comparison between test batteries. (This z test was a comparison of the number of children who increased from the first to the second test to the number of children who decreased from the first to the second test). There was no difference between testing sessions 1, 2, and 3, which can be interpreted to mean that repeated presentations do not change the scores. A comparison of testing sessions 3 and 4, between which training on tasks similar to Test IV was conducted, significant gains were made in the scores of Tests I, IV, V, and VI. It may be assumed that success on Test I is a prerequisite for success on Test IV: therefore, training on Test IV would increase the scores on Test I. Although Test V and Test VI do not seem to be prerequisites for Test IV, training on tasks similar to Test IV apparently has some facilitative effect on Tests V and VI.

After training on a task similar to Test VI, significant gains were made on Test VI from the previous test. The scores on the other tests were not effected. Likewise, training on Test II created significant gains on Test II, but did not effect other's scores.

Training on Test V significantly increased the scores on Test III as well as Test V. Also the scores on Test VI seemed to be facilitated by this training.

The complete interactions may be summarized as follows:

1. Training on a Stage 2 behavior increases performance on Stage 1 tasks and Stage 3 tasks as well as on some Stage 2 tasks.
2. However, one Stage 2 behavior, viewing left and right from another person's standpoint (Test II) is not facilitated by training on another Stage 2 behavior, dealing with right and left relations of two objects.

TABLE 7

EFFECTS OF TRAINING ON PIAGET'S TEST BATTERY
FOR LEFT AND RIGHT CONCEPTS

(Z Test Comparisons Between Sessions)

Tests	Session 1 vs. Session 3 (No Training)	Session 3 vs. Session 4 (Training for Test IV) Stage 2	Session 5 vs. Session 7 (Training for Test VI) Stage 3	Session 7 vs. Session 8 (Training for Test II) Stage 2	Session 9 vs. Session 10 (Training for Test III & V Stages 2 & 3
I					
a =	4	7	3	1	1
d =	4	2	1	1	0
z =	0.0	1.67	1.0	0.0	1.0
p =	.5	.05*	NS(.16)	.16	.16
II					
a =	5	1	2	14	0
d =	4	2	2	1	1
z =	.33	-.58	0	3.36	-1.0
p =	.37	.72	NS (.5)	.0004*	.84
III					
a =	5	5	4	4	5
d =	8	3	4	3	0
z =	-.83	0.7	0	.38	2.24
p =	.80	.24	NS(.5)	.35	.01*
IV					
a =	4	9	4	1	2
d =	3	2	2	3	3
z =	.38	2.11	.82	-1.0	-0.45
p =	.35	.02*	NS(.21)	.84	.67
V					
a =	1	3	1	2	6
d =	0	0	1	0	1
z =	1.0	1.73	0	1.414	1.89
p =	.16	.04*	.5	.09	.03*
VI					
a =	0	3	8	3	5
d =	0	0	2	1	1
z =	..	1.73	1.9	1.0	1.63
p =	..	.04*	.03*	.19	.051*

a = number of children incorrect before training and correct after training.
d = number of children correct before training and incorrect after training.
* - statistical significance.

3. Training on a Stage 3 behavior, right-left relations of three objects, also did not effect one of the Stage 2 behaviors; namely, right and left from another person's standpoint.

To summarize, children whose ages fall in Piaget's developmental Stage 1 of left and right conceptions can function at Stage 2 and Stage 3 levels if appropriate training is conducted. It appeared, moreover, that while Stage 1 functioning was prerequisite for Stage 2 functioning, this relationship did not hold for Stage 2 and Stage 3 functioning. Rather some Stage 2 behaviors are prerequisite for Stage 3 while others are not.

Age is not a barrier to these conceptual skills; rather, with the proper training, in this case using reinforcement, a young child can learn to function with ease on an advanced cognitive level.

Study C. Increased Performance of Several Academic Behaviors at One Time

Problem. As discussed in the Introudction, certain problems often exist in adequately demonstrating the control of certain interventions in educational settings. An ABA design, where the intervention is applied and then removed, may be protested by teachers who justifiably argue that they want to maintain the increased performance, for example, and are not interested in demonstrating the effectiveness of the intervention which brought about the increase. The multiple baseline design overcomes this problem while preserving the need for empirical information on the value of the technique. This study and the replications which follow were designed to show teachers how to use the multiple baseline technique for several subject areas and for many children easily and effectively.

The subject areas selected by the teachers to be taught in these studies reflect major topics in the kindergarten curriculum. These include the identification of shapes (curriculum guide, p. 70), the naming of basic colors (p. 70), and the meaningful use of numbers such as by counting (p. 61). Also included are two additional academic areas which the teachers considered important, the naming of seasons and identification of certain animals.

Subjects. Nineteen prekindergarten children participated in this study.

Response Definition. Two responses were being measured in this study. Each child was asked to identify eight shapes (cross, triangle, square, circle, heart, rectangle, diamond, and oval) and to name the four seasons (Winter, Spring, Summer, and Fall or Autumn). Children were asked to identify all eight shapes and to name all four seasons in each trial. The two behaviors were recorded separately.

Reinforcer Definition. "Happy Faces" were used in the intervention phase of this study for each correct response. "Happy Faces" could be exchanged at the end of the period for a variety of backup reinforcers.

Procedure. A baseline was taken on both responses and the per cent of correct responses was recorded for each category. On the fourth trial, "Happy Faces" were given for each correct season named while the baseline was continued on the shapes. "Happy Faces" were given for each correct shape and season on the sixth through the tenth trials. Feedback was not given during baseline; in the reinforcement phases, children were corrected when giving the wrong answer.

Evaluation Procedure. The multiple baseline technique was utilized in this study.

Results. The use of "Happy Faces" combined with feedback accelerated the rate of correct responses from 0 to 67 per cent for seasons and from 35 per cent to 68 per cent for shapes. Once the procedure was implemented for seasons, correct responding rose to over 50 per cent within 30 minutes. Baseline percentages remain at a low level for shape, however, until the intervention technique is applied directly to that behavior. Once the intervention was applied, moreover, it rose to over 68 per cent within 60 minutes of reinforcement. Table 8 summarizes the data for this study. This method of experimental analysis allows the person implementing the procedure, in this case the teacher, to have confidence in the particular intervention as the vehicle for behavior change. It could be, however, that these results occurred only because these two subject areas were "easy to teach." It is possible that the procedure may not be effective in other settings and with new behaviors and may be behavior specific. The following studies were utilized to explore this question.

TABLE 8

PER CENT OF CORRECT RESPONSES TO TWO STIMULUS CATEGORIES BEFORE AND AFTER INTERVENTION

		"Happy Faces"	
	Baseline	Seasons Only	Seasons & Shapes
Seasons	0%	50.5%	67.0%
Shapes	35%	36.5%	68.6%
Number of Sessions	3	2	4
Total Time	45 min.	30 min.	60 min.

Replications. Could this procedure be extended to the same setting using new behaviors or be used to focus on similar behaviors with a different group of children? The first replication of this multiple baseline technique was designed to answer part of this question.

1. The prekindergarten teacher used the same procedures for teaching her class to count pegs (up to five pegs) and to identify ten colors (orange, green, yellow, purple, black, brown, blue, red, pink, and white).

After a baseline was taken for three sessions during which both behaviors were measured and recorded, it was found that both responses averaged 45 per cent or less correct. Correct peg counting were then reinforced with "Happy Faces." Those children giving an incorrect counting response were corrected and the baseline was continued for color naming. Peg counting increased to 80 per cent correct within 15 minutes of reinforcement while color naming remained the same as in baseline. In the last four days of the study, both responses were reinforced with "Happy Faces" and error responses were corrected with feedback. Peg counting increased to 90 per cent and color naming to 66 per cent after 60 minutes of exposure to reinforcement. A summary of this replication is presented in Table 9.

TABLE 9

PER CENT OF CORRECT RESPONSES IN COUNTING AND COLOR CATEGORIES BEFORE AND AFTER INTERVENTION

		"Happy Faces" + Feedback	
	Baseline	Counting Only	Counting and Color Naming
Peg Counting	41%	80%	90%
Color Naming	45%	45%	66%
Number of Seasons	3	1	4
Time	45 min.	15 min.	60 min.

Here the same teacher as the previous study obtained parallel results. She can be confident that the behavior increases were due to her intervention techniques rather than to some undetermined source.

2. One teacher was able to utilize the multiple baseline for two sets of behaviors and obtained paralleled results. But could the technique be used by other teachers in other settings?

The second replication of this procedure was conducted in another of the kindergarten classes in order to explore this question. Three stimulus categories were used in this study: pictures of animals (giraffe, zebra, hippopotamus, lion, tiger, elephant, deer, and leopard); shapes(triangle, square, rectangle, cross, diamond, oval, circle, and heart); and number cards (one to eight). Five children participated in this study. Each child was presented the stimuli from the three categories and asked, "What is the name of this animal/shape/number?" After five baseline sessions with feedback, "Happy Faces" were given for correct responses in animal naming. Baselines were continued for the other two behaviors. On the ninth session, both animal and shape identification were reinforced with "Happy Faces." The close of the school year intervened and there was no opportunity to reinforce number responses for this group. Nevertheless, the effect of the intervention is clear: an increase of more than 50 per cent in the rate of correct responses, as shown in Table 10.

TABLE 10

PER CENT OF CORRECT RESPONSES TO THREE STIMULUS CATEGORIES

		"Happy Faces" + Feedback	
	Baseline	Animals Only	Animals and Shapes Only
Animals	23.4%	84.3%	95.6%
Shapes	22.2%	23.3%	81.3%
Numbers	28.6%	29.0%	27.3%
Number of Sessions	5	3	3
Time	75 min.	45 min.	45 min.

The teacher was able now to use this information regarding the effects of "Happy Faces" on performance for the larger group of children as well as for new behaviors in her curriculum.

Study D. Use of Past Tense Verbs

Problem. One of the goals of the kindergarten experience as outlined in this curriculum guide is for the child to learn to use the past tense correctly (curriculum guide, p. 60). This study was designed to teach the correct use of the past tense using behavioral principles and to simultaneously test for the generalization of learning to similar verbs. Complex learning is often found to be irreversible in that when the intervention procedures under which the learning was achieved are removed, the behavior maintains in strength. In order to allow for this possibility, a multiple baseline was designed for this study.

Subjects. Five children from one of the kindergarten classes participated in this study.

Response Definition. The experimenter presented 12 pictures to each child separately and asked the child to describe what had happened in each picture. Six of the pictures required a regular past tense verb (jumped, rained, washed, walked, erased, dropped) and six required irregular past tense verbs (sat, threw, read, wrote, rode, fed).

Reinforcer Definition. "Happy Faces" were given for each correct response in the reinforcement phase of the study. "Happy Faces" could be exchanged for edibles as well as special activities and play time.

Procedure. The twelve verbs were presented to each child for four trials, with each trial lasting about 10 minutes per child. Each child was given immediate feedback and corrected if he was in error, but no token reinforcement was given. In the second phase of the study, two of the six regular verbs were reinforced with "Happy Faces" and measures continued and all twelve verbs. In the final phase of the study, two irregular verbs were reinforced. Feedback was continued throughout the study on all verbs.

Evaluation Procedures. The multiple baseline design was the format utilized in this study.

Results. Reinforcement is highly effective in increasing the acquisition rate of past tense usage. Further, reinforcement procedures generalize to other unreinforced, but similar verbs.

As shown in Figure 2, all the verbs averaged less than 20 per cent correct in the Baseline phase. After reinforcement was made available on two of the four regular verbs, 100 per cent accuracy was reached in less than four trials or about 30 minutes of reinforced exposure. The unreinforced regular verbs also increased to an average accuracy of 80 per cent. The irregular verbs remained at baseline levels, even though feedback was available throughout all phases of the study. (A total of three hours of feedback had been given at this point.)

When two of the irregular verbs were reinforced, a similar increase was observed. Both the reinforced and unreinforced verbs rose to 100 per cent accuracy in seven trials or about 75 minutes of training time.

A generalization test for past tense verbs was given all five children following the completion of the study. The experimenter performed some action which required a regular past tense description (clapped, winked, hopped, pulled, pushed, or opened) and asked the child to describe what had happened. As indicated on the figure, the subjects averaged 76 per cent accuracy on all six new verbs.

Use of Past Tense Verbs to Describe Pictures

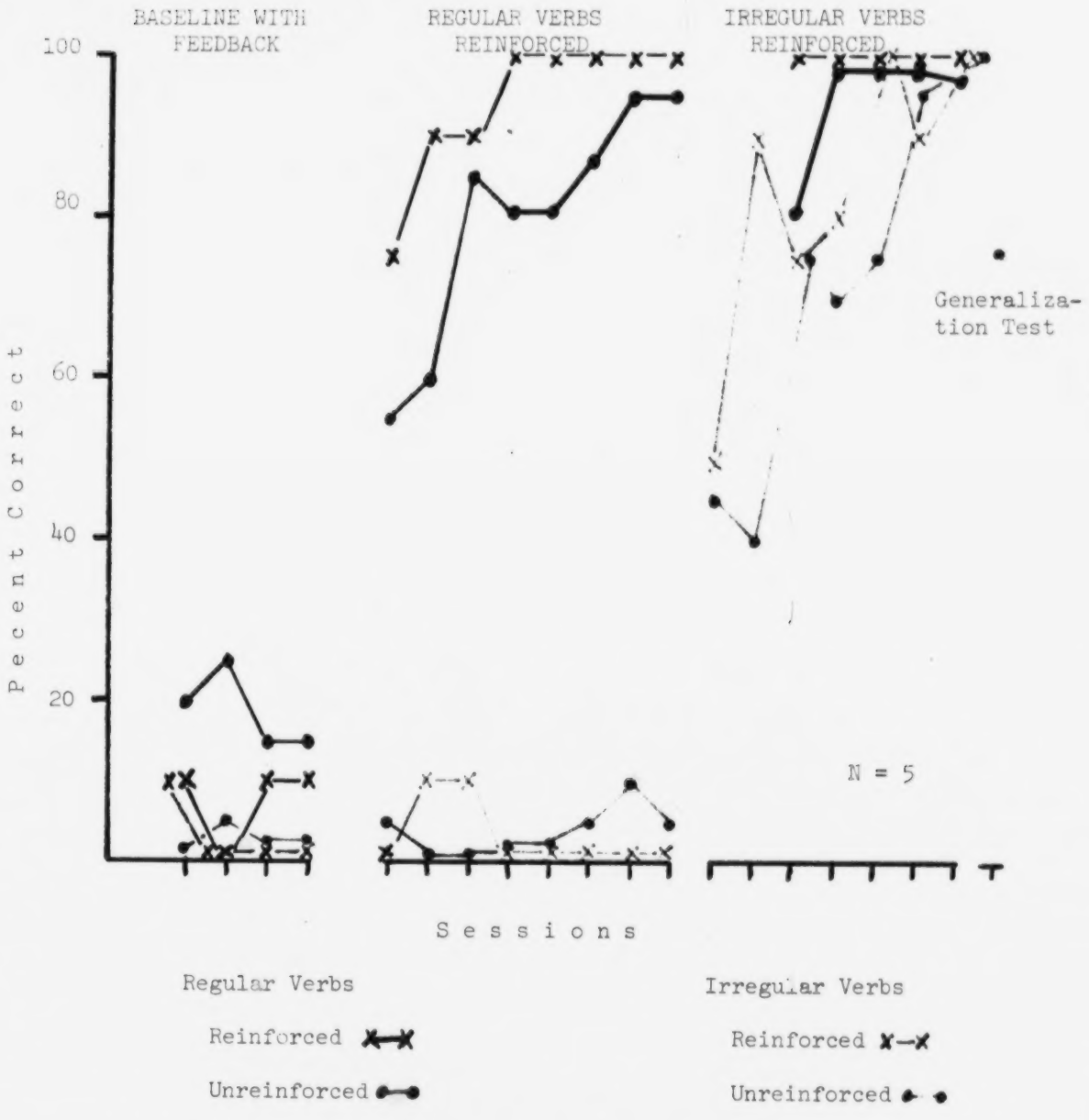

Figure 2.

This far exceeds the baseline measures of the six regular verbs where, with feedback, the children averaged only 13 per cent accuracy after four trials!

Study E. Use of First and Last Positional Concepts

Problem. Another important objective in the kindergarten curriculum is that the child be able to specify which objects or persons in a series are "first" and "last." (Curriculum guide, p. 70). The purpose of this study was to develop an efficient method for effectively teaching this positional concept on both an auditory and visual dimension.

Subjects. Ten kindergarteners participated in this study.

Response Definition. The child was to respond either verbally or by pointing to the question "Which one is last?" or "Which word did I say last?" The stimuli were presented in three categories:

Visual: pictures of banana, lemon, and sun; three different cards with the pictures in different order.

Auditory$_1$: experimenter says "banana," "lemon," "sun."

Auditory$_2$: experimenter says "table," "door," "chair."

The purpose in arranging the stimuli in one auditory category to correspond to the visual stimulus words is to demonstrate the effect, if any, of increased familiarity with the items in the experimental situation. It might be expected that exposure to the visual stimulus items might increase the learning rate of those same items in the auditory dimension over the learning rate for the other auditory stimulus words.

Reinforcer Definition. "Happy Faces" were given as reinforcers in this study. If a child answered at least two items correctly out of three on a trial he was given a "Happy Face."

Evaluation Procedure. The multiple baseline design was utilized in the acquisition phase of this study. In addition, a test of generalization is included to evaluate the carry over effect of the acquisition phase to new, previously untested verbs.

Procedure. Presentations of the stimuli were made in blocks of three in every session; each child was given three opportunities to respond in each of the three categories. Each session lasted approximately six minutes per child. For the visual stimuli, the child was asked, "Which one is last?" The child would either point or give the name of the item. For the auditory stimuli the experimenter would say the three words and ask "Which word did I say last?" The intervention procedures were applied as follows:

1. Baseline: Presentation of all stimuli with questions about "last."
2. Feedback: Presentation of stimuli with questions plus feedback as to correctness of answer.
3. Auditory_2 Responses Reinforced: "Happy Faces" awarded if at least two of the three presentations are answered correctly; feedback continued on the other two categories.
4. Visual Stimulus Reinforced: "Happy Faces" added for visual stimuli and continued on the Auditory_2 stimuli; feedback continued for Auditory_1 stimuli.
5. Auditory_1 Stimuli Reinforced: All categories now reinforced; in addition, both "last" and "first" are requested.
6. Test of Generalization: Five new auditory stimuli are presented and five new visual stimuli are arranged. Children are questioned concerning the stimuli which are in last position using the same question format as in the training procedure.

Results. Reinforcement techniques increase the performance of correctly identifying "last" members of visual and auditory categories. Even after repeated opportunities to respond with feedback given immediately, performance remains well below that achieved when reinforcers follow correct responses. Table 11 summarizes the results for all three stimuli categories.

TABLE 11

PER CENT OF CORRECT RESPONSES TO THREE GROUPS OF STIMULI UNDER THREE CONDITIONS

	Baseline	Baseline With Feedback	Auditory$_2$ Only	Auditory$_2$ and Visual Only	All 3 Stimulus Groups	Generalization Tests: 5 New Stimuli in Each Category
Auditory$_2$	12.8	9.0	85.3	97.5	96.6	Auditory = 100%
Visual	12.3	60.2	52.5	92.5	95.7	Visual = 100%
Auditory$_1$	18.0	15.4	39.8	51.2	95.0	
Number of Sessions	4	5	6	4	6	1
Time per Child	24 min.	30 min.	36 min.	24 min.	36 min.	6 min.

During baseline, the mean correct responses were below 20 per cent. Even when feedback was added (Session 5) and continued throughout the study, the average responses correct remained at 60 per cent or below. When reinforcement was added for correct responses to auditory$_2$ stimuli, however, the rate increased from 9 per cent to 100 per cent within five sessions for an average of 85.3 per cent correct. Correct responses for auditory$_1$ stimuli rose from 50 per cent to 100 per cent for a mean of 92.5 per cent. These same effects held for the visual stimuli, as well (mean = 95.0 under reinforcement).

It is interesting to note that although it was never taught in the experimental phases of this study, the concept of "first" was acquired as "last" was strengthened. In four trials of asking for both responses, (last four sessions in reinforcement phase for all stimuli) the children averaged over 95 per cent correct; of even greater importance is the fact that the concept of last was acquired. This is demonstrated by the generalization tests with five new auditory and five new visual stimuli (last 5 sessions). Performance on these items averaged 90 per cent and 100 per cent, a level for exceeding the baseline rates of the experimental stimuli when they were initially presented.

Study F. Verbalization of Last Name

Problem. The initial objective in the curriculum guide (p. 62) is that the child develop an awareness of self. The guide suggests that one evaluation of this ability is, can the child verbalize his name upon request? This study was designed to shape correct responding to the question, "What is your last name?"

Subjects. Three groups of kindergartners participated in this study. Each group contained approximately 32 children for a total of 95 subjects.

Response Definition. Each child had to produce upon request the correct response to "What is your last name?" Responses had to be made within five seconds of the question.

Reinforcer Definition. Opportunity to hold a puppet and to question another child about his last name constituted the reinforcement for this study.

Evaluation Procedure. A multiple baseline design with the intervention successively used by each of three teachers was utilized in this study.

Procedure. During a baseline period, each child was asked his last name as he entered the classroom in the morning and went to his first group. Feedback was given to each child during baseline and throughout the study. If he answered correctly, the teacher would say, "Yes, that is correct;" if he responded incorrectly or not at all he was told, "Your name is (Anderson)."

After the baseline sessions, one group (Teacher A) was selected to begin using the "Puppet Game." The teacher for this group would hold the puppet and ask the first child nearest her, "What is your last name?" If the child answered correctly, he was allowed to hold the puppet himself and ask the next child his last name. The puppet was passed along in this manner until it returned to the teacher. If a child answered incorrectly or did not answer, the teacher again replied, "Your last name is (Jones)," and another child would be given an opportunity to respond.

During the sessions when this group was playing the puppet games, the other two groups continued under baseline. After the first group under Teacher A had used the puppet game for three sessions, Teacher B began to use the puppet to reinforce the children for answering with their last names. A baseline was continued on the third teacher. Finally, in the fourth phase of the study, all teachers were using the puppet to strengthen correct responding to last names.

Results. Whenever the puppet game was added to questioning and feedback regarding last names, the correct response frequency rose dramatically from as low as 0 to as high as 100 per cent. Table 12 summarizes these data for all three teachers.

TABLE 12

MEAN RATES TO THE QUESTION, "WHAT IS YOUR NAME?"

			Puppet Game		
	N	Baseline	Teacher A	Teachers A & B	Teachers A-B-C
Teacher A	30	0.0%	96%	100%	100%
Teacher B	33	20.3%	25.5%	70.3%	100%
Teacher C	32	23.0%	25%	22.5%	96.8%
Number of Sessions		3	3	4	5
Total Time Per Group		45 min.	45 min.	60 min.	75 min.

Although feedback was given under all conditions of the study, it was only when the reinforcing consequence was attached to correct responses that performance increased and remained consistently high. In a very short time (15 sessions, or less than four hours) and using no additional material or reinforcers, the teachers were able to teach a major social concept to three entire classes totaling 95 children.

Replications. This same study was conducted in the prekindergarten class in order to determine if the results were due only to that group of kindergarteners or if the procedure could be extended. Average attendance at each session was 21 children. Within 10 sessions, or less than two hours, the rate of correct responding rose from 0 to 100 per cent. It is important to note again that not only was this game fun for the children and much more effective than the standard method of daily "drill," but it required very little time, and no expense, to achieve. In fact, it saved valuable teaching time, that might have otherwise been spent in repetition, for more constructive and enjoyable activities.

Study G. Recognition of Written Last Name

Problem. Once the child is able to orally respond to the question, "What is your last name?", the next step is recognition of the written last name (curriculum guide, p. 62). The following procedure was developed to teach this behavior using a game which was both enjoyable and educational for the children.

Subjects. Twenty-seven children in two groups participated in this study.

Response Definition. The child had to recognize his name written in large letters on a plain legal size white envelope (4-1/4 x 9-1/2") within five seconds of the presentation. The child was to raise his hand to indicate recognition.

Reinforcer Definition. Under intervention conditions, correct recognition of his name within the time limit qualified the child to play the "Postman Game." This consisted of the child going up to the teacher who held the envelope with his name and putting a small self-adhesive star onto his envelope. He then "mailed his letter" by placing it through a slot in a shoe box decorated to look like a mail box. For the first four correct trials, he placed the small stars on his envelope before mailing. On the fifth correct trial he placed a large gold star on the envelope and could then take it home to keep.

Evaluation Procedure. A multiple baseline with the intervention being utilized by the two groups in succession was used in this study.

Procedure. A multiple baseline design was used for this study. Baselines were taken on both groups by having the teacher present the names one at a time before the class. If a child recognized his name and raised his hand, the teacher said, "That's right, (John), this is your name: (John)." If the correct child did not recognize his name, she would say "(Bill), this is your name. Look at it very carefully. See the large (B)?" and so on.

Following the baseline, Group I began playing the Postman Game. After three sessions, Group II began to use the Game. The procedure remained

the same as under the baseline except that those recognizing their names were permitted to "mail their letters" and begin accumulating their stars.

Results. Recognition of first names dramatically increases from 36 per cent to 100 per cent in Group I in less than 45 minutes of training time and from 25 per cent to 96 per cent in Group II when the Postman Game is introduced as a reinforcer for responding correctly. The results can be seen most clearly in Table 13. Although feedback was given continuously, it was only after the Game was made available to those responding correctly that performance rose. The motivational aspects of game-like learning activities cannot be more convincingly shown than by these simple demonstrations. It is only when continuous measures are being taken, however, that the teacher, too, can see the real effect of her efforts. And with the proper experimental design, she is able to pinpoint exactly what accounted for the change in the child's performance, thus enabling her to focus her efforts in a specific direction rather than hoping that good results will just happen.

TABLE 13

PER CENT OF CHILDREN CORRECTLY RECOGNIZING LAST NAME

		Postman Game	
	Baseline	Group I Only	Groups I & II
Group I	35.7%	100%	100%
Group II	24.5%	23.7%	96.1%
Number of Sessions	4	3	7
Total Time	60 min.	45 min.	105 min.

Study H. Recognition of Written Last Name from a Group of Names

Problem. While the previous study demonstrates an effective method for teaching the recognition of an individual name, it has certain limits. Increasingly, as he enters first grade activities, the child's name will

be among others in a larger group with children whose name may be very similar to his in shape and length. He will need not only to recognize his when presented but further to be able to discriminate his name from others in the group. This study presents an expansion of the previous one designed to complete the learning process begun by the first study.

Subjects. Thirty-two kindergarten children participated in this study.

Response Definitions. The children were asked to select their name written on an envelope from a group containing 12 to 14 other names. Trials were run on both the first name and the last name separately.

Reinforcer Definition. The "Postman Game" referred to in the previous study was used as the reinforcing consequence.

Evaluation Procedure. The intervention was applied in this study in a multiple baseline design format.

Procedure. Under the baseline condition, subjects were asked to select their names from a table containing envelopes, upon each of which one name was written. After a child selected his name he was told if he was correct or incorrect and, if in error, he was shown his name. His name was then replaced and another child had a turn. Trials were run for both first and last names. Following the baseline, the Postman Game was begun for last names only. The exercise of selecting either first or last names from the large groups was continued each day. In the final session, the Postman Game was also used for the first name recognition. The name selection from the group was continued for first and last names.

Results. The game-like learning of the Postman exercise greatly facilitates recognition of both first and last names. Baseline with feedback produced a 31.2 per cent level of accuracy for last names and a 43 per cent level for first names, the percentage correct rose to 89 per cent in approximately 20 minutes of exposure to the Game for last names; while recognition of first names, which was not being reinforced, rose only slightly to 34.5 per cent. In the final phase where the Postman Game was used for both names, per cent correct rose to 100 per cent. Table 14 summarizes the data for all 32 children.

TABLE 14

PER CENT OF CORRECT RECOGNITION OF NAMES
FROM LARGER GROUP

		Postman Game	
	Baseline with Feedback	Last Names	First/Last Names
Last Names	31.2%	89.0%	100%
First Names	43.0%	54.5%	100%
Number of Trials	4	7	1
Total Time Per Child	12 min.	21 min.	3 min.

Clearly, the addition of the Postman Game as a learning medium for name recognition directly improves the child's skill in discriminating his name from the larger group of names. Although feedback was given continuously and no reinforcement was given in addition to the teacher's own natural reinforcers, performance increased immediately when the game was introduced. Again, if there had been no systematic records made of the child's performance, the teacher may not have been able to identify the controlling factors behind the increases. With these records, however, which serve as feedback for the teacher herself, the intervention may be re-applied in other academic areas to augment the children's performance.

Study I. The Effect of a Charting Procedure on Academic Performance

Problem. A token reinforcement procedure was established in order to increase performance in two skills: number recognition and letter recognition. The teacher and aide at Luckie Street kindergarten felt that even though the token system was more successful than their usual method, it was too much trouble and too time consuming for them to use. A new system utilizing social reinforcement was implemented which was much more convenient for the teacher and aide.

Subject and Setting. Twenty-five kindergarten children took part in this study. The study was designed by the behavioral consultant but conducted mostly by the teacher and aide.

Response Definition. The behavior of interest here was the verbal response of identifying the correct number or letter when shown the symbol for that number or letter.

Evaluation Procedure. A multiple baseline design was utilized in this study to determine the effects of teacher's usual method, token reinforcement, and a charting procedure.

Procedure. A multiple baseline across individuals was used to measure the effects of: (1) the teacher's usual procedure, (2) token reinforcement, and (3) charting procedure on letter and number recognition. (Not all subjects went through all three procedures.)

The teacher's ususal procedure consisted of showing the children as a class various numbers and letters and having them respond as a class to that number or letter. After each teaching session, in order for the effects of these procedures to be known, the children were dividided into three groups (the teacher, aide, and consultant each taking a group) and each child was asked individually 26 letters of the alphabet or 10 numbers. For those children who knew their numbers, data was collected on the alphabet. For the others, data was collected on numbers until they knew all of them, at which time they were switched to the alphabet.

During the token procedure, the teacher no longer worked with the children as a group, but during the data collection, the children were given one token for each correct response. These tokens were exchangeable later in the day for special activities, trinkets, and candy.

The use of tokens was dropped during the charting procedure. Instead, each child was given a graph with his name, the days of the week along the abscissa, and the numbers 1 through 10 or 1 through 26 (dependent on whether the child was working on numbers or alphabet) along the ordinate. During data collection, after a child had been asked the numbers or letters, the teacher, aide, or consultant added up the number correct and made a mark in the appropriate place on the child's graph. The child was then given a gummed star to lick and place over the mark on the chart. If the

child was improving, the teacher (or aide or consultant) offered praise. At the end of the day, all children whose start was "higher" than the day before (i.e., had improved) were asked to stand up, and the rest of the class including teacher, aide, and consultant applauded.

Results. Since number of sessions under each condition is different for each student[2], analysis of the results will be made as follows:

1. In order to determine the effects of each condition, the scores on the first three sessions of each condition (i.e., teachers' usual method, tokens, charts) will be compared to the tenth, eleventh, and twelfth session of that condition. (This will control for the number of sessions per condition, since this varies from condition to condition for each student.)

2. In order to determine the immediate effects and tokens and charts, the mean of the last three sessions under teacher's method will be compared to the mean of the first three sessions under tokens; and the mean of the last three sessions under teachers' method will be compared to the mean of the first three sessions under the charting procedure for those children. who went from teacher's method directly to charts.

Table 15 gives the t scores (repeated measures) for the first comparison mentioned previously. There were significant gains using the token and charting procedure, but not using the teacher's ususal procedure. Since the amount of change during the charting procedure was higher than the amount of change under the token procedure, a t test for independent means was calculated to compare these amounts of change. The results show that the amount of change under token reinforcement is not significantly different from the amount of change under the charting procedure (t=1.04666, with 18 df; $p < .5$ two tailed).

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[2]This experiment was originally designed as a multiple baseline across three groups. This would have facilitated dissemination of results and would have made the interpretations much clearer. However, the high rate of absenteeism made it impossible to keep the children in groups.

TABLE 15

THE EFFECTS OF TEACHER'S USUAL METHOD, TOKENS, AND CHARTING PROCEDURE ON NUMBER AND LETTER DISCRIMINATION

	Teacher's Usual Method	Tokens	Charting Procedure
Mean of First Three Sessions	8.57	11.39	10.30
Mean of 10th, 11th, and 12th, Sessions	8.34	16.27	12.95
Number of Students	9	5	15
t	.5843	2.5195	3.401
df	8	4	14
p	NS	.05	.001

Table 16 shows the immediate effects of tokens and charts. It is interesting to note that there are no immediate effects in the use of tokens.

TABLE 16

IMMEDIATE EFFECTS OF TOKENS AND CHARTS

	Tokens	Charts
Mean Number Correct Last 3 Days of Teacher's Method	2.75	9.25
Mean Number Correct First 3 days of Procedure	3.67	13.11
t	1.99317	3.5596
df	3	5
p	NS	.01

The teacher's usual method had no effect on the acquisition of letter and number recognition. However, the token reinforcement and the charting procedure as used here did have statistically significant positive effects. The effects of the token reinforcement procedure is not immediate, but gradual; whereas, with the charting procedure the effects were seen immediately. However, the overall effects of the charting procedure are not greater than the overall effects of token procedure.

Replications. A charting procedure with very limited social reinforcement was compared to a token reinforcement system at another kindergarten. Would the effects of charting and token procedures be equally effective and would they be superior to feedback alone? The response being recorded was color recognition, and 10 children participated.

The charting procedure was basically the same as described in the original study except that no recognition was given to those children whose performance increased. Social reinforcement was given to each correct answer but not to performance as a whole. The results indicate that their charting procedure was not significantly more effective (in terms of amount of increase) than a baseline (feedback only) procedure ($t = 0.709$, with 9 df. $p < .25$, one-tailed). The token procedure, however, was statistically significantly more effective ($t = 1.8708$, with 9 df, $p < .05$, one-tailed).

Study L. The Effects of Performance Criteria on Academic Behavior

Problem. One of the most difficult tasks facing the classroom teacher who has a number of children under her supervision is to monitor their behavior sufficiently to know when to increase the complexity of the subject area. If the teacher requires a certain level of performance over a longer period of time, she may find the child easily completes that requirement and may become bored with the lack of challenge. On the other hand, if she demands too much of the child all at once, she discourages him completely. The skillful teacher raises her requirements very gradually, constantly monitoring the effects each increment has on the child's performance. This study is an example of such a procedure.

Subjects and Setting. Nine kindergarten children participated in this study. The behavioral consultant conducted this study over a period of 15 weeks.

Response Definition. The response under observation was the addition of positive whole numbers, the sums of which are no greater than 10. Each addition problem was written on one side of a 3 x 5" card, with the answer written on the back. Problems were arranged into seven units; Unit I being the Problems "1 + 0" through "1 + 9," Unit II "2 + 0" through "2 + 8," and so forth. (Since we are considering here only problems whose sums are no greater than 10, the numbers of items per unit diminish as ones from Unit I through Unit VII.)

Reinforcer Definition. "Happy Faces" were made contingent upon meeting criteria on a specific unit. The "Happy Faces" were not exchanged for backup reinforcers, but they were associated with increased social reinforcement.

Evaluation Procedure. This study utilized both reversal design controls (within each child) as well as multiple baseline controls (between children).

Procedure. During experimental sessions, the children were taken to a small room near the kindergarten classroom and were given specific units to study. (The units had to be passed in numeric order, i.e., Unit I had to be passed before studying for Unit II, etc.). As soon as a child thought he was ready, he brought his cards to the consultant who sat in one corner of the room. After making sure that the problem side of the cards all faced the same direction, the consultant placed the cards before the child, who answered the problems orally as fast as he could. In addition to seeing the problems in written form, the consultant verbally repeated each problem to the child. The child's responses were time and rate correctly (i.e., number of problems answered correctly per minute) and rate incorrect were calculated. These rates then were plotted by the child, with the help of the consultant, on his graph which was placed on public display in the classroom. When a child met criteria (to be discussed later) on a particular unit, he was given a "Happy Face" to wear the rest of the day. Also, an announcement was

each day to the whole class, priaisng, by name, those children who met critieria that day.

Reliability of consultant's reading speed and the interval between one card being answered and the next card being read was undetermined by tape recording one session for each child, and later measuring, with a stopwatch, the reading speed and inter-stimulus interval.

Three separate criteria were used in this study and are identified as "high," "medium," and "low." Each criteria consists of a minimum rate of correct answers and a maximum rate of incorrect answers. High criteria was determined by testing four children who had gone through five months of first grade and who were considered by their teacher as being her "smartest" students. These children were given three random assortments of ten problems each (on 3 x 5" cards) to answer. The average rate correct was 9.91 per minute and the average rate incorrect was 1.15 per minute. Therefore, high criteria for this study was defined as 10.0 or more correct answers per minute, and 1.2 or less incorrect answers per minute. Medium and low criteria were arbitrarily defined as 7.0 correct per minute and 2.2 incorrect per minute, and 4.0 correct per minute and 2.3 incorrect per minute, respectively.

Criteria were varied at different times for each student, providing multiple baseline as well as reversal controls. Table 17 gives the units under each criteria for each student. One student, S_7 was not able to meet high criteria on Unit II after 17 tries; consequently, high criteria was re-defined for him as 9.0 correct per minute and 1.2 incorrect per minute.

Results. Reliability checks on consultant's reading speed show that, out of 29 presentations over 9 Ss, at no time did the reading of the item take more than one second. The range of inter-stimulus interval (i.e., time between the answer of one problem and the reading of the next) was 1.2 seconds to 2.4 seconds which does not significantly affect the data.

TABLE 17

UNITS UNDER EACH CRITERIA FOR EACH STUDENT

Student	High Criteria	Medium Criteria	Low Criteria
1	1, 2, 5, 6	3, 7	4
2	1, 4, 6, 8	2, 3, 5, 7	...
3	1, 2, 3, 6, 7	...	4, 5
4	3, 7	5, 6	1, 2, 4
5	4, 5	1, 2, 3, 6, 7	...
6	1	4	2, 3
7	1, 2, 4*	...	3
8	1, 4, 5, 6	2, 3	...
9	1	4	2, 3

* High criteria for this student was changed to 9.0 correct and 1.2 incorrect per minute (see text).

(Note: Not all children went through all 7 units. This was due to frequent absenteeism and lack of time.)

Figured 3 gives the performance of a representative student. It should be noticed that the final performance is greatly influenced by the criteria.

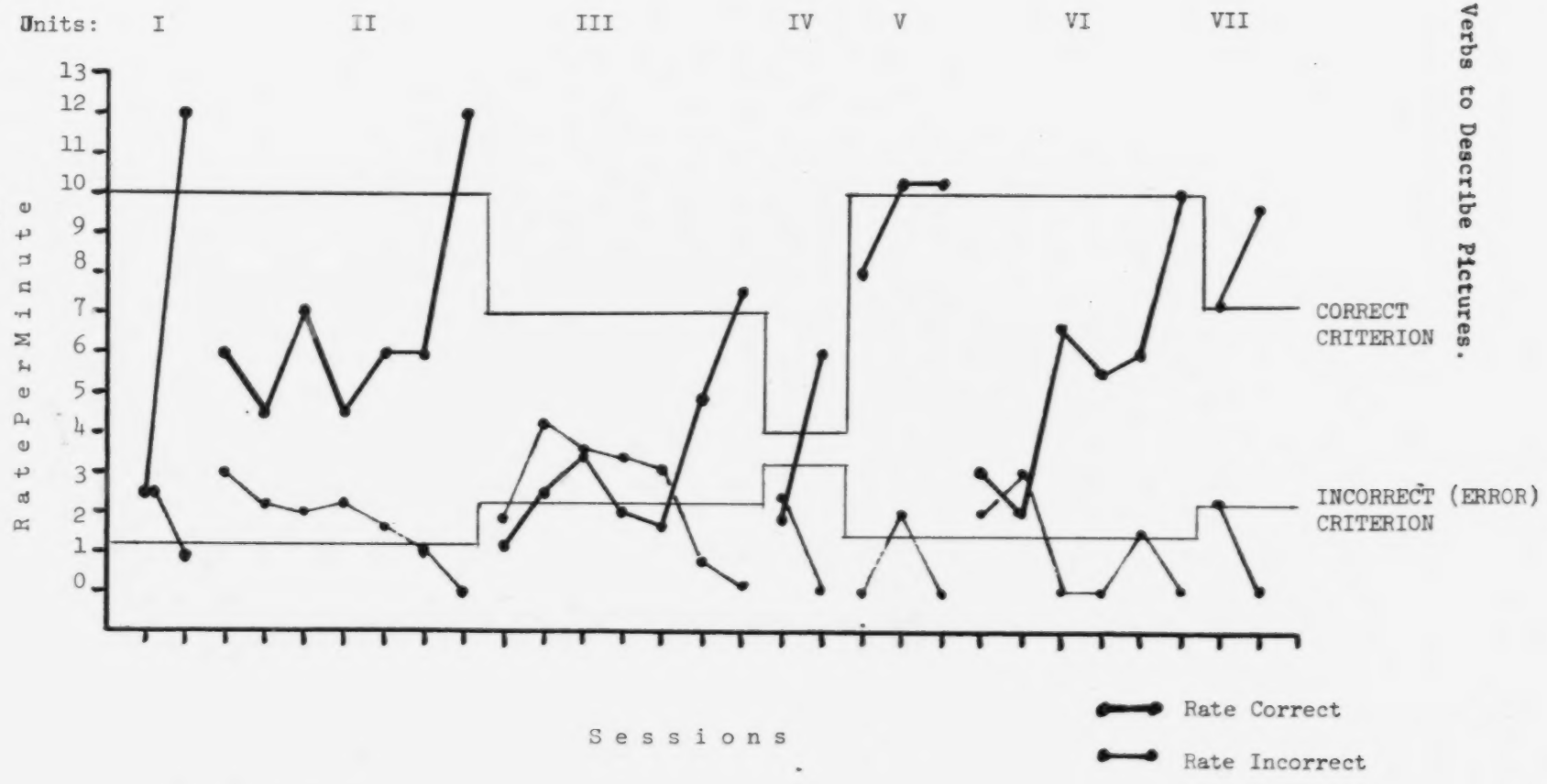
In only three cases involving two students did the performance under one criteria meet the standards of higher criteria.

Table 18 shows group averages over the three criteria. Average rate correct and rate incorrect over all attempts is shown as well as average rate correct and rate incorrect on the final try of each unit. The mean number of attempts per unit is also shown.

Figure 4 shows the performance on Unit II for the one student whose criteria was lowerred after 17 tries. Notice that his performance increased slowly for the first 13 attempts and then began to decrease steadily. As soon as the new criteria was announced, his performance increased to this previous best performance.

Figure 3.

Performance of a Representative Student Under Varying Criteria.



Use of Past Tense Verbs to Describe Pictures.

TABLE 18

MEAN RATE CORRECT AND INCORRECT FOR EACH SESSION AND FOR FINAL TRY ON EACH UNIT UNDER HIGH, MEDIUM, AND LOW CRITERIA

	HIGH CRITERIA 10.0 correct/minute 1.2 incorrect/minute	MEDIUM CRITERIA 7.0 correct/minute 2.2 incorrect/minute	LOW CRITERIA 4.0 correct/minute 3.2 incorrect/minute
Mean Rate Correct	7.26/minute	6.05/minute	3.85/minute
Mean Rate Incorrect	2.24/minute	2.16/minute	2.69/minute
Mean Rate Correct Final Try	11.78/minute	8.9/minute	5.32/minute
Mean Rate Incorrect Final Try	0.15/minute	0.77/minute	1.4/minute
Mean Number Of Tries Per Unit	4.7	3.5	3.7

Rate Correct on Unit 2 for Student Whose High

Criteria was Lowered to 9.0 Correct Addition Problems Per Minute

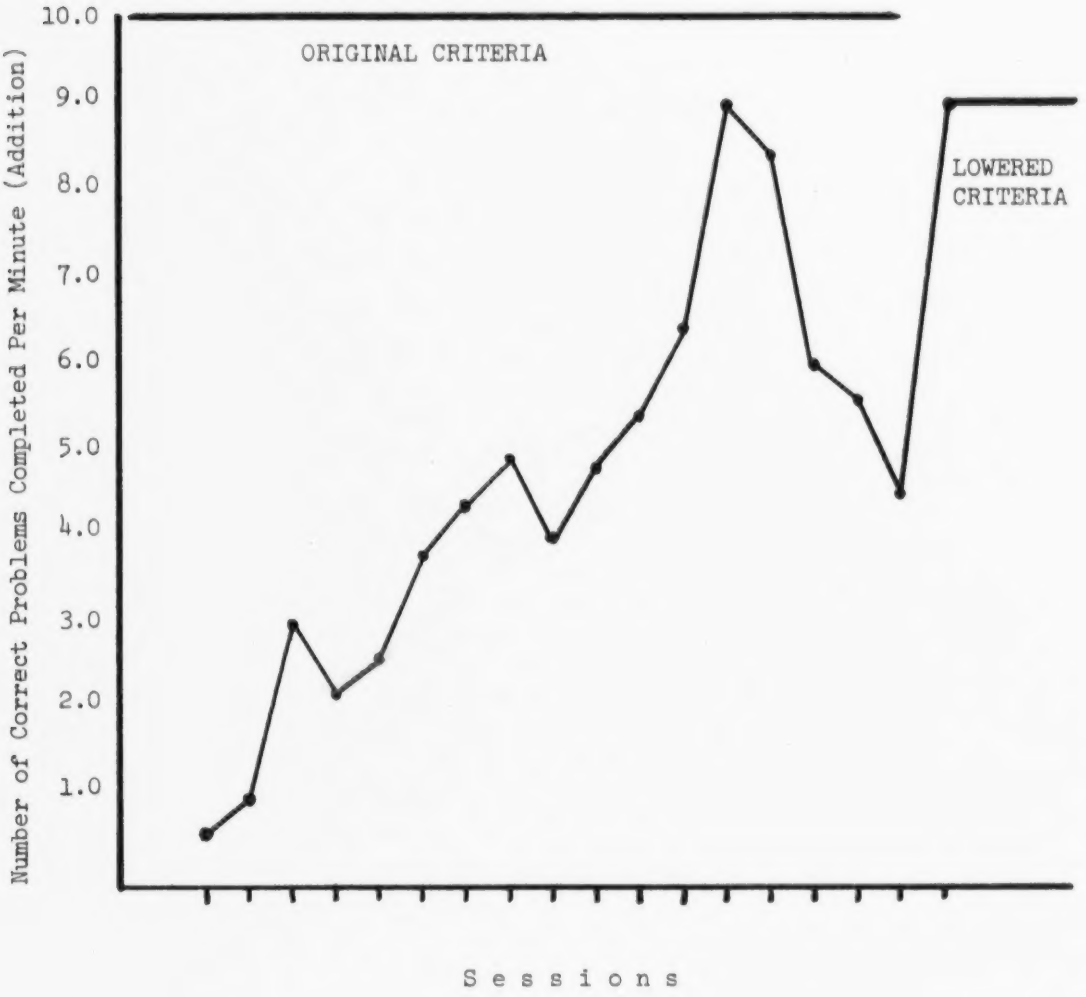


Figure 4.

The main point being made here is that the criteria that a teacher sets for a success greatly influences the level of performance attained by her students. It should also be pointed out that, although it is not systematically demonstrated here, criteria should be defined as precisely as possible and that the behavior in question should be measured as precisely as possible. In the kindergarten setting, very seldom, if ever, is a criterion set by the teacher concerning a certain academic behavior, and when even a vague criterion is set, such as seen in the curriculum guide, the students are not made aware of the criterion, of their level of performance, or of any trends in performance toward or away from that criterion.

Study K. The Use of Brief Instructional Periods to Accelerate Academic Performance

Problem. Often, a teacher may find that she can ask a child a question such as a color, and if she allows him two or three minutes, he may give her the correct answer. Given these conditions, she may consider that he doesn't really know the color for the time required for the answer suggests a very weak link. The target goal for the teacher is some cases may be not to teach a child a certain behavior, but to insure that he can respond within a specified period of time. The following study was designed to achieve such a goal. The problem for this teacher was how to keep the children working individually and consistently so that she could be free to assist those who needed help rather than spend her time in coaxing and prompting the others to respond at their best.

Subjects. Approximately 15 children in both the morning and afternoon groups of one kindergarten were selected for the Write and See Program. These children needed additional practice in basic skills preparatory to first grade reading as well as the effects to be driven from fine motor skill practice in marking the answers.

Response Definition. The Write and See[3] programmed prereading series was an important part of the academic program for a particular group of

[3]The Write and See prereading series is a concept of building program constructed by Behavioral Design Associates, Inc., for New Century Publishers and distributed by Appleton-Century-Crofts.

kindergarteners. It was designed for those children who need remedial work in those skill areas component to reading readiness and, more importantly, the child works at his own pace in the series of 36 worksheets. Each worksheet in the Write and See series had four pages, each page contained four to six items requiring a response. Responses were made by rubbing a chemically treated pen across a choice of answers. If the correct choice is made, the answer turns darker, but no color change occurs when an incorrect answer is rubbed. (By having only one stimulus change condition, for correct answers only, the possibility is eliminated of the child rubbing all answers simply to see the different color changes. See "Prekindergarten Program Evaluation," Research and Development Report, Volume V, Number 3, Summer, 1971, Atlanta Public Schools, p. 21.

A daily record was kept of the length of time each child spent on the Write and See material. The figure was divided by the number of pages he completed to yield an average rate of minutes spent working on each page.

Reinforcer Definition. Tokens which could be exchanged for backup reinforcers were the consequences used in this study. Painted, uncapped soft drink crowns (unused bottle caps) were used as tokens.

Evaluation Procedure. An ABAC or modified reversal design was utilized in this study.

Procedure. Since this program is worked individually, several children may be on different levels of the 36 booklet series. A folder was kept on each child's work and his next booklet was prepared before each session. At the end of the session he received one token for every booklet he had completed. During the baseline period a record was kept of average time to complete one page. Following the baseline period an announcement was made to the class that if a child finished his booklet before the timer rang (10 minutes) he would get five tokens. The bell was re-set for 10 more minutes after the first period and a child who finished before the second bell would earn two tokens. This high rate of pay-off was designed to answer two questions: first, were the children working at their maximum rate per minute or could their efficiency be increased; and,

second, could the tokens be used more effectively to produce a higher performance rate? Following this condition, baseline conditions were reinstated and the rate per minute continued to be recorded. The final phase of the study was similar to the baselines in that the tokens earned rate was one per completed booklet. Delivery was varied, however, instead of acquiring their tokens at the end of the period, each child received his token as soon as he completed the booklet. During all phases of the study, the child could do as many booklets as he wished, but he had to work on at least one per day.

Results. Performance as measured in minutes to complete a page of Write and See can be controlled by the available work time and amount of token pay-off. The average amount of time spent to complete one page was 12 minutes during baseline, 4 minutes during the first reinforcement phase, 10 minutes during the return to baseline, and 4 minutes during the last reinforcement phase. Immediate token delivery as well as increased magnitude of reinforcement for speed both sharply reduced baseline work time. The data for two subjects from one of the groups is presented in Figure 5. The average number of minutes to complete a page in each condition are presented for the other children in Table 19.

In all cases, the baseline speed was increased by 50 per cent and more when the increased token pay-off for speed was introduced. This procedure was extremely effective in getting very high performance speeds but only one booklet would be completed per session under these conditions. Those children who had earned five tokens would not be as motivated to do more work and the teacher could not easily supervise this group in another activity while timing the remaining children on Write and See material. Another procedure was needed which would motivate the children to increase their performance rate while not placing a great demand on the teacher. A return to baseline conditions, prior to the second intervention, did not fully recover the initial base rate for all the children. This suggests that perhaps as soon as some children learn to increase their performance efficiency the effect is not immediately reduced.

Average Times for Two Representative Children to

Complete One Page in the Write and See Program.

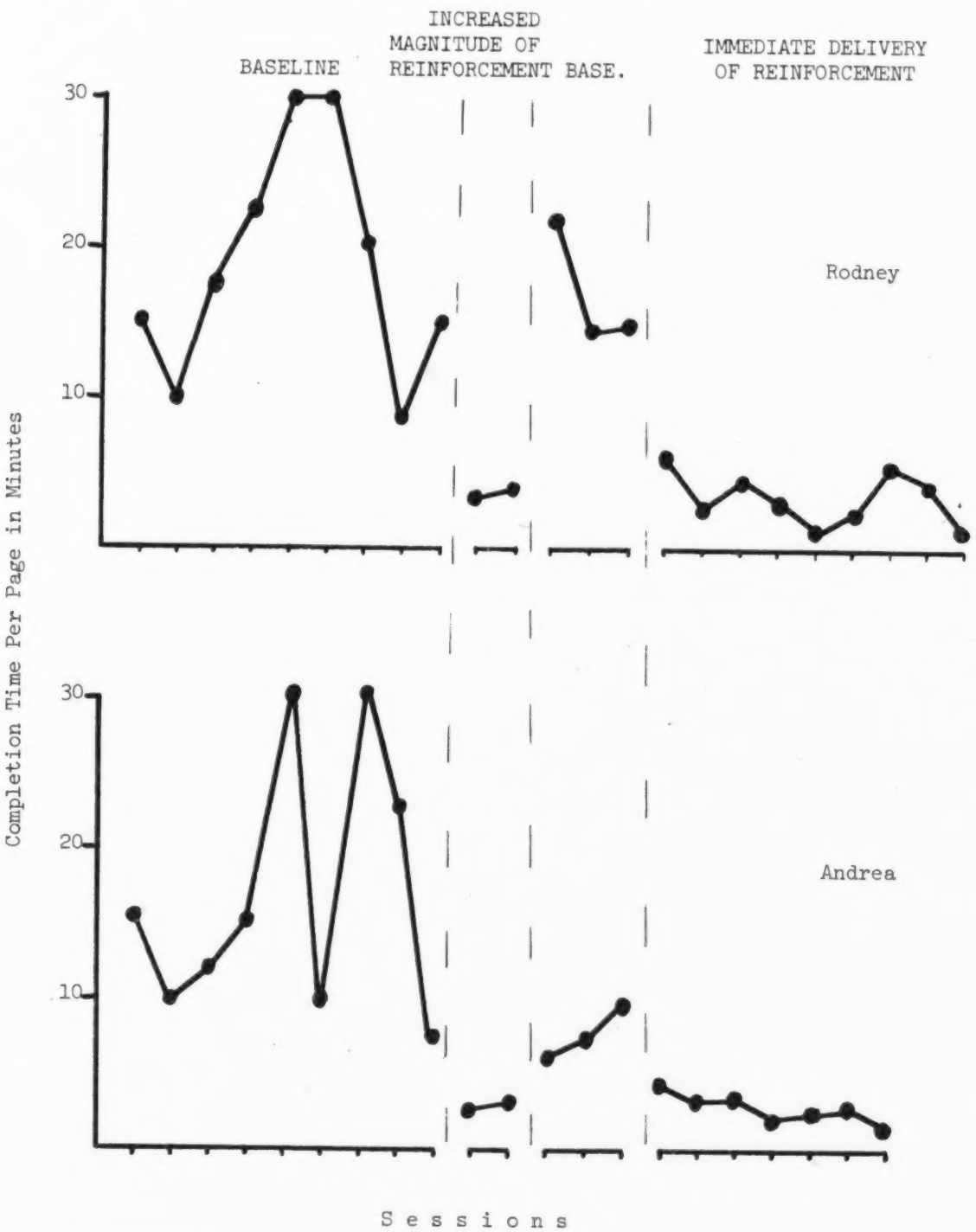


Figure 5.

TABLE 19

AVERAGE TIME IN MINUTES TO COMPLETE ONE PAGE FOR THE WRITE AND SEE PROGRAM

Child	Baseline	Increased Magnitude of Reinforcement	Return to Baseline	Immediate Delivery of Reinforcement
James	10.10	5.20	11.67	4.44
Nathan	10.83	2.25	16.10	3.64
Gary	8.69	3.90	10.15	4.14
Matthew	9.90	4.50	11.67	4.50
Linda	7.61	1.25	5.90	3.62
Reginald	12.25	3.75	15.85	3.90
Vickie	12.88	4.80	7.50	4.04
Loretta	6.48	1.50	5.95	4.60
Otis	17.95	3.30	7.75	4.81
Andrea	16.89	3.90	7.93	3.57
Lutishua	9.38	4.50	4.10	2.38
Lamar	15.71	6.13	6.65	5.11
Rodney	18.79	4.40	17.50	4.07
Andrew	15.58	Absent during these phases		4.68
Ralph	8.00	Absent during these phases		5.39
Number of Days Per Phase	10	2	5	11

In the fourth condition, where the tokens earned rate is the same as the baseline rate but the delivery is immediate rather than delayed, performance again decreases from the baseline rate. While these decreases are not as pronounced as the increased magnitude condition, the children completed more booklets per session and worked individually for a greater period of time, thus, allowing the teacher to move freely among those children who needed her assistance. The other group of 14 children followed this procedure and obtained parallel results.

The pressure of a reinforcer does not in itself guarantee the production of the desired behavior. Variables must be carefully explored and analyzed in order to make the most efficient use of all resources. The time interval made available for completion of a task is one such variable. A child may be able to count to five, for example, but if the task takes him ten minutes to complete one, might suggest that he

hasn't mastered the concept of counting adequately. Indeed, he may be allowed that extended interval so frequently that he "fills the available time" until he actually needs ten minutes to count to five. This study attempted, in part, to reduce the teacher-imposed work interval to the actual time the children needed. Attention must also be given to the situation in which the procedure is to be used. If it puts too great a demand upon the implementer, the intervention will be dropped or altered until it is no longer recognizable. The phases of this study represent the development of one procedure from effective but cumbersome to effective and comfortable.

V. SOCIAL SKILLS

Although the academic behaviors described in the previous section present a major area of interest to the preschool teacher, other concerns of the teaching staff became apparent as the school year progressed. Social skill development is an important facet of the kindergarten program. Included in this category are such behaviors as cooperation, responsibility, and an awareness of one's self as a member of a group. It is also important for an effective program that disruptive behaviors be reduced and rechanneled into constructive social and academic behaviors. This section presents several studies which focus directly upon these goals. The techniques used are designed to complement the academic program and to give the teacher additional tools for an effective program.

While this section is presented after the academic studies, it represents efforts to solve certain problems which are often the primary concern of the kindergarten teacher. In many cases, the task of socializing the children to sit quietly when asked, to follow directions, and to maintain orderly movement from one site to another precedes any attention to academic tasks. Therefore, the first four studies in this section will present some solutions to general classroom management problems through reinforcement for academic behaviors (good performance on academic material being incompatible with disruptive behavior). In the second study, disruption is controlled by consequences levied for the disruptive behavior itself. The third study used a combination

of reinforcement for academic performance and adversive consequences for disruption. The fourth study deals with disruption in a nonacademic setting. The last two studies in this section deal with important skills of relating to effective participation in group-based activities.

Study A. Disruption Controlled by Academic Reinforcement

Problem. The prekindergarten teacher felt that disruptive behavior during language sessions was making it impossible for her to teach. The children would not follow her directions or respect the rights of others to be taught (Curriculum guide, p. 60), and so she decided something had to be done.

Subjects and Setting. This study was conducted during a 45 minute language session in a prekindergarten classroom. The study lasted 16 days and all 20 students participated.

Response Definition. Disruptive behavior was defined as any of the following responses: biting another child, out of seat without permission, and talking without permission or loudly enough to disturb the ongoing activity. The number of incidents of this behavior was counted under all phases of the study.

Reinforcer Definition. Under the reinforcement phases, "Happy Faces" were distributed for correct answers to questions. These tokens could later be exchanged for edibles, trinkets, or activities.

Evaluation Procedure. A reversal design was used to evaluate the effectiveness of "Happy Face" tokens in an ABAB procedure.

Procedure. The class was divided into three groups. A seven day baseline was taken on disruptive behavior using a time-sampling procedure to measure the occurrence of disruptive behavior under the teachers' usual teaching conditions. Then, for the next three days, the teachers were instructed to give the children tokens ("Happy Faces") for correct answers to questions concerning the language session. Baseline conditions (i.e., no tokens) were then reinstated for the next three days in order to assess whether or not the tokens and not merely the passage of time or some other variable was responsible for any changes in disruption.

Finally, disruption was measured for three more days under the token reinforcement procedure.

Results and Discussion. When "Happy Faces" were given for correct answers during academic group time, the number of disruptive incidents was reduced from a baseline average of 30.4 per session to less than 10 incidents in a 45 minute period. After only three sessions of reinforcement for correct responses, the number of incidents was reduced to one-half of its baseline level or less. Table 20 shows the average number of out of seat, talking, and hitting incidents per 45 minute session under each of the various conditions.

TABLE 20

AVERAGE NUMBER OF INCIDENTS OF THREE DISRUPTIVE BEHAVIORS PER 45-MINUTE PERIOD UNDER TWO TEACHING CONDITIONS

Behaviors	Baseline	"Happy Faces"	Return to Baseline	"Happy Faces"
Out of Seat	16.0	5.3	12.0	5.0
Talking	10.1	4.6	4.7	4.0
Hitting	4.3	2.3	3.6	0.7
Number of Sessions	7	3	3	3

The data clearly indicates that reinforcement for academic responses was responsible for a significant decrease in disruption for whatever tokens are available, the incidence of classroom disruption remains low. Since paying attention was a prerequisite for answering the questions and earning tokens, disruptive behavior was reduced.

Study B. Disruption Controlled by Reinforcement for Nondisruption

Problem. One kindergarten teacher was concerned about classroom disruption while she was reading. The teacher felt that it was important for the children to be exposed to "children" stories, but the children's

misbehavior was too distracting to her and she was not able to read to them under those conditions.

Subjects and Setting. All 21 children in the kindergarten class at Luckie Street School participated in this study. The study was conducted during "story time" at which time the students were seated on a rug. This study lasted eight days.

Response Definition. The behaviors which the teacher considered distracting to her in this situation were moving about, talking, and hitting. These behaviors were labeled as Type 1. Data was collected on these three behaviors and also on two behaviors which the teacher did not mention: attending to something other than the teacher (e.g., looking out of the window, playing with some object) and whispering at a level the teacher could not hear. These behaviors were labeled as Type 2.

Reinforcer Definition. Tokens were given to children who were nondisruptive during the reading period. Tokens would be exchanged during recess for "pushes" in the swing and at the end of the day for candy and trinkets.

Evaluation Procedure. Pre-post measures were taken to evaluate the effects of token reinforcement for nondisruption before and after the introduction of the "Happy Faces."

Procedure. In order to facilitate data collection, each child was assigned a "patch" of rug. A time sampling procedure (10 second interval) was used to measure the amount of disruptive behavior. Two classes of disruptive behavior were recorded. First of all, if a child was not in his "patch" of rug, or was talking, or was hitting someone, that interval was labeled as disruptive, Type 1. If a child was whispering where the teacher could not hear or if the child was attending to something else, that interval was labeled as disruptive, Type 2. Disruptive behavior was measured over two conditions: baseline (first five days) and reinforcement (next three days). Reinforcement consisted of tokens given every five minutes for not exhibiting any disruptive, Type 1, behavior. If, during a five minute period a child was disruptive, the teacher would call out his name, and the consultant would write it down. On the first day, the consultant went around the room at the end of each

five minute period and awarded tokens to those who were to receive them. For the next two days, the tokens were given out at the end of "story time." If a child's name was called out twice during a five minute period, he was put in a chair at the back of the room and was required to sit quietly for a complete five minute period before being allowed back on the rug where he could earn tokens.

Results. Those disruptive behaviors which are in contingent relationship with reinforcers were reduced under the reinforcement phase from a baseline average of over 28 per cent to less than 6 per cent in only three sessions (less than 60 minutes), whereas, those disruptive behaviors which are not in contingent relationship with the reinforcers remained the same under reinforcement (mean of 20 per cent throughout). Reducing disruptive behaviors, Type 1, did not generalize to disruptive behaviors, Type 2. Figure 6 shows the frequency of Type 1 and Type 2 disruptive behaviors.

Another interesting phenomenon seen in Figure 6 is the steady increase in disruption in the baseline phase (from about 6 incidences to 15 in 5 days). This is probably due to novelty effect of the seating arrangement which initially suppressed the disruptive behavior.

Study C. Disruption Controlled by Reinforcement for Academic Performance and Loss of Reinforcement for Disruption

Problem. The highly disruptive behavior of one child was of major concern to the teachers at one kindergarten. They felt that this child's behavior was a function of his not having breakfast before coming to school.

Subjects and Setting. One five year old male at the kindergarten served as the subject to this experiment. All data collection took place during 1-1/2 hours of academic activities.

Response Definition. Disruption in this study was defined as: (1) falling out of chair, (2) talking out of turn, (3) out of seat (without instruction), and (4) hitting.

Disruptive Intervals in Percent

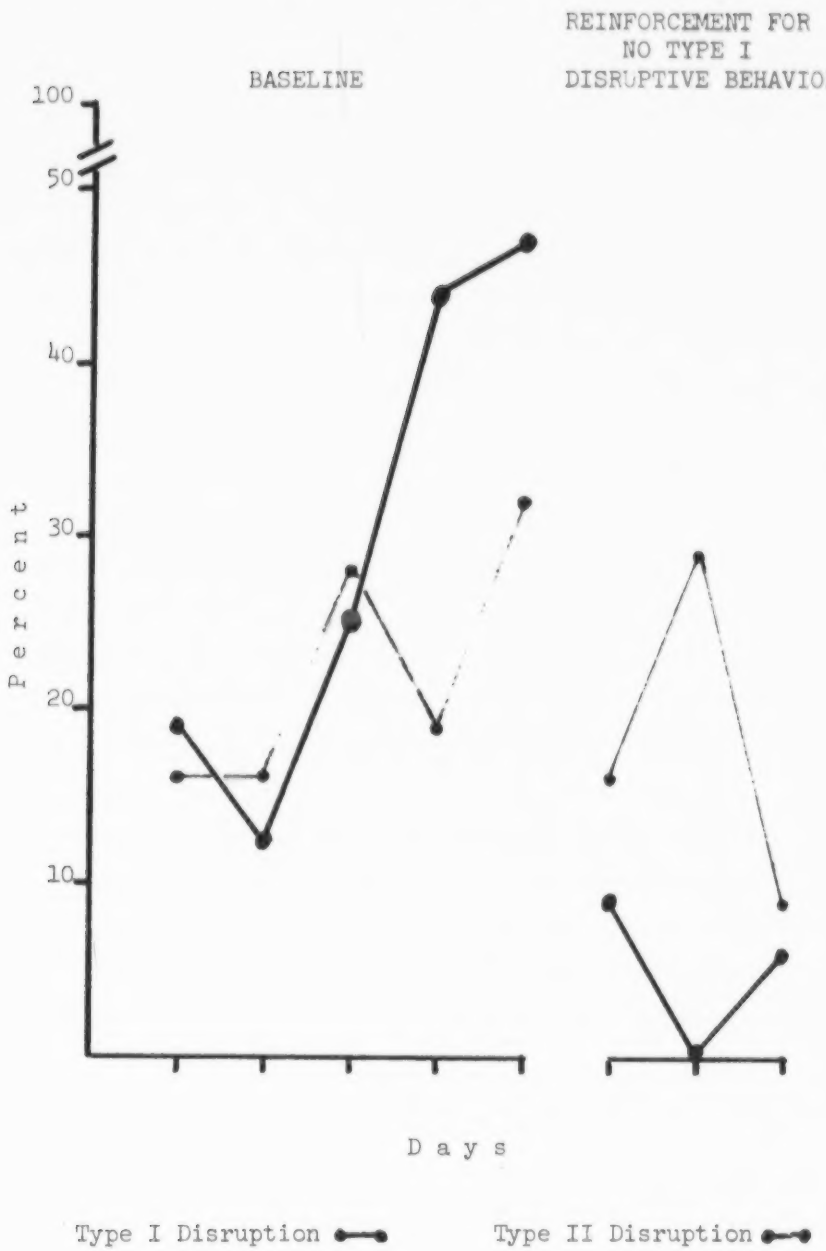


Figure 6.

Reinforcer Definition. Tokens were delivered for correct answers to questions during academics. Tokens could be exchanged for candy, cereal, or special activities.

Evaluation Procedure. A reversal design was utilized in this study in order to demonstrate the control of the intervention procedures. The notation for this particular intervention is an ABCAC design to designate each condition in the study.

Procedure. Using a time-sampling procedure, the disruptive behavior of the subject was measured for five days under normal conditions during academics (baseline). In conjunction with the teacher's theory as to the cause of disruption, cereal was given to the subject every morning and his behavior continued to be recorded during the academic period (Intervention I). A token system was established during the Intervention II phase. Tokens were made contingent on correct answers to questions posed by the teachers. A second contingency was in effect: token loss for disruptive behavior. The whole class participated in these procedures, but data was collected on the one child only. These procedures were used for the next 11 days except for the fifth day which served as a return to baseline in order to demonstrate the tokens' control of the behavior.

Results. A token system for academic performance combined with a response-cost system for disruption can dramatically reduce disruptive classroom behavior. Time sampling revealed that the subject's disruptive behavior ranged from 67 per cent of the time to 76 per cent of the time (mean = 69.8) during the five days of baseline as shown in Table 21. For the next 10 days, when cereal was made available to the child every morning, disruption remained high ranging from 71 to 97 per cent of the time (mean = 4.9) in less than two hours of the reinforcement conditions. On the one day when baseline conditions were reinstated, disruption rose to 61 per cent.

TABLE 21

RANGE AND MEAN PER CENT OF DISRUPTION FOR EACH PHASE

	Range of Disruption	Mean Per Cent of Disruption	Total Time
Baseline	67% - 76%	69.8%	150 min.
Noncontingent Cereal	71% - 95%	79.0%	300 min.
Tokens for Academic and Token Loss for Disruption	6% - 14%	8.7%	120 min.
Return to Baseline	61% (one day)	61.0%	30 min.
Tokens for Academic and Token Loss for Disruption	0% - 4%	2.5%	180 min.

Study D. Disruption in a Nonacademic Setting

Problem. The kindergarten teachers at Stanton were concerned about the children's lack of good manners: at meal time in the school cafeteria. Several children would start throwing food or running about and soon the whole group was noisy and upset. After discussing the problem with the behavioral consultant, it was decided that, through the use of reinforcement, good table manners and related social niceties be strengthened.

Subject and Setting. Forth-two children from one kindergarten class participated in this study.

Response Definition. Disruptive behavior in the cafeteria was defined as: talking loudly, running instead of walking, being out of seat at inappropriate times, hitting, and throwing food.

Reinforcer Definition. Bubble gum or ice cream made available after lunch served as reinforcement.

Procedure. When the children came to the cafeteria, they were seated at one large table which was called the "Good Table." If a child exhibited any disruptive behavior, he was moved to another table. During the first four days of this study, no visible distinction was made between the "Good Table" and the other tables. For the next four days, all children who were still seateed at the "Good Table" by the end of the lunch period were given bubble gum. After this phase of the experiment, a return to baseline (i.e., no bubble gum) was established for four days. Data collection ceased at this time but was begun again under baseline conditions. After three days of baseline, reinforcement (this time ice cream) was again made available to those children who remained seated at the "Good Table" throughout the lunch period.

Results. "Good behavior" in children can be increased from a baseline rate of 55 per cent of the group to 95 per cent of the children in four sessions and finally to 100 per cent when reinforcement is given for nondisruption. Table 22 gives, for each phase, the mean per cent of students seated at the "Good Table" at the end of the lunch period. It can be noticed that the per cent of children seated at the "Good Table" at the end of the lunch is greatly increased by the use of contingent reinforcmenent. The behavior remained high when the reinforcing consequence was removed. Data collection ceased at this time because the desired effects had been achieved after four days of intervention. However, the teacher felt that disruptive behavior was increasing gradually and three months later data was again collected which demonstrated that disruption had indeed increased. When reinforcement was reinstated, disruption again decreased sharply.

TABLE 22

PER CENT OF CHILDREN SEATED AT "GOOD TABLE"
AT END OF LUNCH PERIOD

	No Consequence	Reinforcement Contingent to Remaining at "Good Table"	No Consequence	3 Months Lapse	No Consequence	Reinforcement Contingent to Remaining at "Good Table"
Mean Per Cent of Children	55%	95%	95%		69%	100%
Number of Days	4	4	4		3	3

Study E. Developing Readiness for Group Activities

Problem. A typical activity schedule in the standard kindergarten class might include 30 minutes for juice and cookies, 20 minutes for show and tell, 30 minutes for small group activities, and so on. In one kindergarten class, the research assistant noted that several minutes were spent after each activity change when the children had to move from one small group area to another in getting them to settle down. When the teacher was asked about this occurrence, she replied that it was a problem for her but that the children were frisky and preferred to play rather than to move quickly and then sit quietly. The objective set for the problem was to enable the children, once they were directed to a new group, to move quickly and settle down at once for the new group activity (curriculum guide, p. 76). Indeed, could their attention span and concentration be increased so that they moved deliberately and firmly without being distracted by other children into engaging in play?

Subjects. The teacher and two teacher aides each directed a group of approximately 14 children. Since the groups of children assigned to each adult varied from activity to activity, the adults' behaviors were a more parsimonious measure to record.

Response Definition. When one activity had ended and the teacher announced that it was time for a new group and directed the children to

the next activity, the research assistant recorded the time. After the children had gone to the area assigned and seated themselves and the next activity was begun, the time was again recorded. The difference in minutes constituted the response under observation.

Reinforcer Definition. Sweetened breakfast cereals additional to their daily scheduled snack were used in this study. Each child received a piece of cereal according to the intervention outlined below.

Evaluation Procedures. A multiple baseline design was used in this study. A timer and reinforcement delivered to children were used as independent variables.

Procedure. One of the teacher aides was given a kitchen timer which she would set at the time of the group change. She instructed the children who were to move into her group that if they were ready to begin their activity before the timer bell rang, they would receive a piece of cereal. She then set the timer and all three groups changed simultaneously. Those children who were in place when the timer rang received their cereal. Those still playing or in the wrong place received no reinforcement. After several sessions, the other teacher aide began to use a timer with the same instructions to her group. Measures were taken continuously on all three adults in the kindergarten.

Results. The use of a standard kitchen timer combined with reinforcing consequences greatly facilitates activity change time. Teacher $Aide_1$ reduced the amount of time it took her to begin an activity after a group change from over 12 minutes to 2 minutes, a reduction of over 83 per cent. Teacher $Aide_2$ reduced her time from 8 minutes to 2 minutes, a reduction interval to 25 per cent of the baseline level. The teacher, who did not use the timer, remained at an even level throughout the study.

The average change time in minutes for each of the three adults in the groups is shown in Table 23. Clearly, the use of an external stimulus, paired with reinforcement, can override the natural higher probability behaviors of children to play and move about. When there is a tangible consequence for them changing groups directly, delay time is cut as much as 83 per cent.

TABLE 23

AVERAGE TIME IN MINUTES FOR CHILDREN TO MOVE GROUPS AND PREPARE FOR NEW GROUP ACTIVITY

	Baseline No Timer No Reinforcement	Time Plus Reinforcement	
		Teacher $Aide_1$ Only	Teacher $Aide_1$ and Teacher $Aide_2$
Teacher $Aide_1$	12.66	3.26	2.00
Teacher $Aide_2$	8.33	6.56	2.07
Teacher	5.33	6.88	5.32

Replications. This study was conducted in two other classes following the identical procedure, and in a third class the procedure was varied slightly to correct an additional problem.

1. The afternoon group of this same kindergarten also had a problem with efficient group changes. But would the same procedures prove effective for a new group of children or were the children in the first study simply very easy to manage? After applying the intervention in the same fashion as outlined, the results were parallel. Teacher $Aide_1$ cut her time to less than 25 per cent of the baseline while Teacher $Aide_2$ reduced her time to less than one-half of its original level. The teacher, not using the timer, remained the same throughout the study. Table 24 summarizes these results. In this case, there is a slight reduction in time spent by the teacher before starting the next activity. The fact that the children in two groups were taking less time to change from one activity to another had an effect on the third group as they moved between activities.

TABLE 24

TIME IN MINUTES FOR CHILDREN TO CHANGE GROUPS AND PREPARE FOR NEW GROUP ACTIVITY

		Timer	
	Baseline	Teacher Aide$_1$ Only	Teacher Aide$_1$ and Teacher Aide$_2$
Teacher Aide$_1$	8.00	2.86	1.77
Teacher Aide$_2$	5.14	5.87	2.04
Teacher	5.51	5.75	4.35

2. The second replication was conducted in the prekindergarten class. The teacher, assistant teacher, and teacher aide spent a great deal of their time disciplining their children and wanted a solution to their problem. But were these children perhaps too young to follow such complex directions as required for quick movement? The timer plus reinforcement was introduced in an attempt to correct this situation. The reinforcers in this study were "Happy Faces" which would be traded in for play time, recess, and edibles. The contingency remained the same for earning the reinforcement, that is, the children had to move into the next group before the timer rang. The design of this replication also varied from the original study; instead of a multiple baseline, an ABAB design was used. Here, the inervention (timer plus reinforcement) was used by all three adults, removed entirely, and then replaced. Table 25 gives the average time in minutes spent by each adult before beginning the next activity. All three adults reduced the time spent in getting ready for one activity by more than 22 per cent in less than three sessions. These data are consistent with the previous results.

TABLE 25

TIME IN MINUTES TO BEGIN ACTIVITY BEFORE AND AFTER INTERVENTION

	Baseline No Timer No Happy Faces	Timer + Happy Faces	Return to Baseline	Timer + Happy Faces
Teacher	7.50	6.17	9.00	5.83
Assistant Teacher	7.80	6.00	7.83	5.83
Teacher Aide	8.70	6.83	9.00	6.67
Sessions	5	3	3	3

3. A third replication of this procedure was conducted in a class where an additional problem hindered effective movement from group to group. The standard-sized classroom was used for three groups, each averaging 15 children. Thus, 45 children in both the morning and in the afternoon groups participated in the study. The system in the classroom was such that each time the children changed from one group to the next, they took their chairs with them. This created some problems in traffic and movement was slow of necessity to prevent injury enroute to the next group. To evaluate the problem before the intervention was applied, the number of children present in their seats was counted one minute after the group change was announced. This number, divided into the number of children present, yielded a per cent of children seated after one minute.

To apply the timer plus cereal procedure would very likely increase the children's effort to arrive "on time" in their next group but might prove hazardous with the present system of movement. The solution, of course, was quite simple; the chairs remained in a permanent arrangement and the children moved freely from group to group. A summary of the effect of this topographical change combined with the timer and its incentive for rapid change is presented in Table 26. This intervention resulted in more than twice as many children seated and ready for their lessons after one minute of "change time" with a total intervention time of less than 15 minutes.

TABLE 26

PER CENT OF CHILDREN SEATED AFTER ONE MINUTE OF CHANGE TIME

	N	Usual Method of Change (Children Carry Chairs)	New Topography + Timer and Incentives
Kindergarten (A.M.)	45	32%	79%
Kindergarten (P.M.)	45	28%	70%
Number of Sessions		12	10

Clearly, the changes made in the intervention phase increased the per cent of children who were settled and ready for the next lesson to begin by two and one-half times the baseline level. Again, these results are consistent with the data from the previous three studies utilizing the timer procedures.

This particular replication is important in that it emphasizes the importance of evaluating possible effects of any intervention given the environment in which it is to be implemented. While not all effects can be accurately predicted, certain obvious ones, such as rapid movement with the wooden chairs, are clearly dangerous. Effective maintenance of change following an intervention necessitates some projected analysis of its results. To overlook or ignore important members of the behavioral chain under focus could result in an ineffective intervention or worse, create an even greater problem.

Study F. Increased Participation During Group Time Through Reinforcement Problem. Evaluation of a child's understanding material presented by the teacher can be made only if the teacher gets some feedback from the child. Assessment is typically made by asking the child questions which are structured to give the teacher the necessary information. In one kindergarten, the research assistant observed that often only a few of the children in the group were questioned about the material. The teachers could forget whom they had questioned

and neglect some of the group. Further, effective communications skills in a group is an important kindergarten objective (curriculum guide, p. 65). Thus, a procedure was needed which would insure that all children would be asked at least one question and also would make answering the questions a highly rewarding experience. An additional effect would be to increase their concentration and attention to the teacher.

Subjects. Two teachers and an aide were the individuals whose behavior was being recorded. Each had an average group of 14 children.

Response Definition. The research assistant recorded the number of children asked at least one question in each group. Groups lasted for 15 minutes each.

Reinforcer Definition. "Happy Faces" were the conditioned reinforcers which could be traded in for play time, recess, and edibles.

Evaluation Procedure. This study utilized a reversal design. Token reinforcement served as the independent variable in the intervention phases (B) of this ABAB design.

Procedure. During the baseline period, the teachers themselves recorded the number of children who were asked a question during that period. Each adult was provided with a checklist with each child's name and a place for a check mark to be recorded. The teacher utilized her own natural reinforcers for the children's correct answers such as praise, smile, and attention. The assistant teacher then suggested that the teacher award "Happy Faces" for correct answers. Since the children were familiar with the token system, they knew the consequences provided by the "Happy Faces." After six trials under this condition, the "Happy Faces" were withdrawn in an attempt to see if the teacher's question-asking behavior would maintain in strength without the "Happy Faces" to prompt her. The final condition was a return to the use of "Happy Faces" for correct answers, to complete the final phase of the ABAB design.

Results. "Happy Faces" serve to prompt the teacher so that every child is given an opportunity to answer a question. Under baseline

conditions, the per cent of children questioned ranged from less than 4 per cent to 48 per cent, while using the "Happy Faces," 100 per cent of the children were given an opportunity to respond. Every child was asked a question after the second session (30 minutes) of using the "Happy Faces," and continued at a 100 per cent during all other sessions using the "Happy Faces." Table 27 shows the change in rate of children questioned over the four phases of the study.

TABLE 27

PER CENT OF CHILDREN ASKED QUESTIONS
BEFORE AND AFTER INTERVENTION

	Baseline	"Happy Faces"	Return to Baseline	"Happy Faces"
Teacher	27.4%	99%	0.0%	100%
Teacher	48.0%	100%	17.6%	100%
Teacher Aide	4.4%	100%	4.4%	100%
Sessions	5	6	5	3
Total Time	75 min.	90 min.	75 min.	45 min.

Even though the teachers were using a list of the children's names under the baseline conditions, that did prompt them to ask every child a question. Only when the children themselves prompted the teacher to ask them questions, that is give them an opportunity to be reinforced by a "Happy Face," did the teacher question every child. Further group attention was greatly enhanced since it was necessary to pay close attention to the teacher in order to answer the question correctly.

Discussion. In both this study and the studies using the kitchen timer, the interventions were designed to alter one variable which controlled a long behavior chain. The analysis which preceded these interventions attempted to identify those variables or behavioral

events which, if changed in a certain way, would produce other desired changes in the environment. The analysis provided an efficient means for change with very little alteration in the ongoing schedule. The addition of two stimuli, a timer and "Happy Faces," plus, reinforcement, were sufficient to produce major effects upon academic teaching efficiency.

VI. ADDITIONAL BASELINES ON ACADEMIC AND SOCIAL BEHAVIORS

The preceding sections have presented studies whose central focus was upon increasing the performance or the complexity of academic behaviors as well as the complementary studies which focused upon general classroom maintenance functions. Each of these studies emerged from a problem in the preschool setting and teaching staff-research consultant team methodically set about to correct that problem. These studies do not represent the entire spectrum of behaviors which were focused upon by the Behavior Modification staff. Frequently, after a behavior was selected by the teacher from the curriculum guide, and the children's performance on that behavior was assessed, it was found that the children readily acquired the skill without further techniques. Another common finding was that often, to the pleasant surprise of the teacher, the children already "knew" the behavior she had selected as her teaching goal. Until the performance was systematically observed and recorded, she had had no idea of the extent to which it existed in the children's repertoire. A few examples of this strategy which require evaluation prior to teaching are listed as follows:

A. After selecting the goal of teaching, using, and understanding prepositions (curriculum guide, p. 60) a baseline was taken on a group of 14 children to determine how well they could perform with the following prepositions: under, over, between, in, on, beside, around, below, with, and inside. The children were presented with three prepositions at random in each trial and asked to perform some simple task with each word. For example, the teacher said, "Put the ring around the block," or "Put the crayon under your chair," and so forth. After four trials this group averaged 73 per cent correct on their responses. A similar group of 13 children

averaged 75 per cent correct after five trials using prepositions. With baselines this high, the children have already acquired a working knowledge of the most common prepositions. Further, with the feedback that was given under the baseline conditions, the per cent of correct responses was increasing trial by trial (60 per cent to 83 per cent for one group and 58 per cent to 87 per cent for the second group). Clearly, no special procedures would be needed to bring this behavior up to 100 per cent correct within a few trials without any supplementary techniques.

B. One teacher wanted to insure that her class (22 children) could take off and put on their coats properly (curriculum guide, p. 64). After one trial she found they could perform this behavior at a 100 per cent level of accuracy.

C. Another teacher selected the goal of teaching her children to bounce and catch a ball (curriculum guide, p. 67). The entire class of 22 children was found to have this skill when systematically observed and the teacher was free to focus upon another skill.

D. Eye-hand coordination is a critical component of many complex behaviors (curriculum guide, p. 67), so an exercise was selected by one teacher to test this skill. She found that her entire class was able to stack five or more blocks upon one another, thus, indicating to her that their visual perception and five motor muscles were in harmonious coordination.

E. Another aspect of visual perception pertains to accurate identification of one's belongings in the class (curriculum guide, p. 68). When one teacher tested this skill among her class (N = 20), she found that 91 per cent of her children could correctly point out their own paintings displayed in the classroom.

F. In another classroom, the teacher had used her own method for teaching visual recognition of the written name for several months while other studies were being conducted. Her method consisted of presenting cards with the name printed upon the card to a group of children seated in front of her. Correct recognition resulted in a great deal

of praise and attention while feedback was given to those not recognizing their names. When the teacher recorded the accuracy of their responses she found that the children (N = 22) averaged between 86 per cent and 91 per cent correct in their name recognition. Again, these performance levels were either already in the repertoire of the children or were very rapidly acquired, thus, requiring no auxiliary techniques by the teacher. It was not until the strategy of preliminary evaluation was utilized by the teacher, prior to formally teaching these behaviors, did she discover that further teaching was either minimally required or totally unnecessary. Without this simple step between deciding upon a goal behavior and the implementation of teaching techniques she might have wasted her own time and bored the children when they could all be engaged in a more advanced and exciting kindergarten activity.

VII. DISCUSSION

Preschool children on the kindergarten and prekindergarten level can be taught a great number of social behaviors and academic skills in a short period of time. The concept of early childhood education is not new nor is the feasibility of such early learning programs a remote possibility. Both are in full operation in many areas and the practice of public preschool education is extending both laterally, to reach more children, and horizontally, to reach children at increasingly younger ages.

What is new is the application of a behavioral technology which can make this expansion more effective and efficient. This approach seeks to provide the teaching staff with systems of measurement and analysis which serve as feedback loops in the ongoing process of teaching. The dynamic interaction which exists between the teacher and the child is not interrupted nor is the function of the teacher interferred with in any way. Every objective presented in these studies was selected by the teacher herself, and reflects the unique needs of her class. Additional assistance was made available only when requested by the teacher in order to better achieve her objectives.

But what are the effects of such a system on the children for whom it is implemented? After the teachers began utilizing the techniques described in these studies, the 213 children in the Behavior Modification program could engage in a wide variety of activities with little or no disruption. This dramatic reduction in disruptive behaviors also extended outside the classroom so that the full range of kindergarten activities could be conducted with maximum effectiveness. With classroom management problems virtually eliminated, the children were able to rapidly learn a wide variety of academic subjects, including name recognition, left and right discrimination, correct use of the past tense, color and shape recognition, and the positional concepts of first and last. In addition, those basic self-concept experiences which develop from effective functioning both as an individual and as a group member were made more fruitful as general classroom functioning became more harmonious.

These benefits for the children in the Behavior Modification program reflect, of course, parallel benefits for the teachers in the day-to-day teaching experience. But the program provided each teacher with more than simply a highly productive school year. One particular need that seemed to be present in every classroom was for a more effective system of monitoring the various activities which occur in the kindergarten classroom. How could the teacher insure that the children were learning and that the classroom was running at its most efficient level? Requiring that she burden herself with complicated and time-consuming records would be no solution nor would continuing the open-ended, more intuitive system which gives no feedback, provide the answer to her problem. In an attempt to resolve this problem, the method of sampling classroom behaviors was developed for the teacher's use. For example, she could determine for herself if group movements from place to place were being achieved at an efficient level. By using the kitchen timer technique, she has a system which simultaneously measures the behavior she is observing and controls the behavior as well (by having the children try to "beat the clock"). This sampling procedure was easily extended to academic activities, for the nature of scheduling in the kindergarten readily lends itself to periodic opportunities for the teacher to systematically record how well the children are responding to her teaching procedures. Sampling varied from small notations on the back of a name card to a check mark on a

prepared record sheet to the stars that the children themselves placed on their charts. The effect was the same in all cases: sampling provides a permanent and unambiguous account for the children's responses and gives the teacher feedback on the effect of her procedures.

An unexpected pay-off often accrued from this systematic method of observing the children's social and academic behavior. The teacher frequently discovered after a sampling session that the target behavior she herself had selected from the curriculum guide as her next teaching objective was already performed by the children at a high level of proficiency. One teacher, for example, found that her class could respond correctly to 75 per cent of the prepositional directions she gave them with no time spent in formal teaching. By a quick sampling of the children's ability prior to direct teaching, the teacher saved herself teaching time which she could devote to the children's weaker academic areas. Since this sampling technique is built-in her regular teaching procedures, no additional requirements are made on the teacher's time. In fact, as in the example above, sampling can often save the teacher a great deal of time.

The question still remains, however, as to the expense of an effort such as this. Even though the results from this program are undeniably impressive for both the children and the teachers; if the cost is prohibitive, it would be unfeasible for wide application. Indeed, the public education system is already stretched to its budgetary limits. It is significant to note that the Behavior Modification program achieved its results at a cost of less than $0.86 per child for the entire period of the program. This figure represents the total amount spent in purchasing all edibles and tangible reinforcers, special equipment such as stopwatches, and all special recognitions for achievements such as large stars for wall charts. Clearly, large sums of money are not necessary to achieve the desired results. Taken together, then, the Behavior Modification program provided benefits for both children and teachers, and at a negligible cost. There is little to justify any educational program which cannot incorporate these same achievements.